Development and implementation of an information system for the “Gremio de Maestros Mecánicos y Afines de Ibarra”

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***Abstract*— This degree work includes the implementation of an information system that automates the activities of the Gremio de Maestros Mecánicos y Afines de Ibarra with the purpose of introduce the technology as support to the executed operations to reduce the cost of time and resources.**

***Palabras Clave*— Gremio de Maestros Mecánicos y Afines de Ibarra, information system, yii.**

I. INTRODUCTION

Gremio de Maestros Mecánicos y Afines de Ibarra is an institution without ends of profit, regulated by Junta de Defensa del Artesano; founded On October 24, 1956 on a meeting realized in the facilities of Choferes's Union. His activity is centred on the defense of the interests of his members, especially on the labor, wage and tributary area [1].

Nowadays it is shaped for brought near of 300 members, their operations are realized by basic tools of technologies of the information and handle a physical record of historical information; spreadsheets of Excel with relative information to: income and expenses, control of assistances for meetings, monthly quotas, income collected for sports events; and in other formats: personal information of members, vouchers of summons and assistances, planning of courses, control of social activities, digital support of documentation, and others.

The implementation of the system of management of information in the Gremio de Maestros Mecánicos y Afines de Ibarra will facilitate to the entity the storage of information, to support the consistency in information and numbers, will guarantee the safety of financial information and of supports of physical documentation that needs to be stored, will simplify the process of obtaining result and statistics of the stored information, monetary results of reports of income and expenses, will integrate processes and will avoid the duplicity of records, beside making possible a simple update of personal information of the members.

A. General Objective

Develop and implement an information system for the management of the “Gremio de Maestros Mecánicos y Afines de Ibarra” using the Yii framework.

B. Specific Objectives

1) Analyze current processes of the Gremio de Maestros Mecánicos y Afines de Ibarra.

2) Apply the methodology SCRUM in the development of the system

3) Identify the benefits of the implementation of a web system in the Gremio de Maestros Mecánicos y Afines de Ibarra.

4) Develop an information system orientated to the web using the Yii framework.

C. Scope

The project has as end develop a web system that allows the management of information arranged in the Gremio de Maestros Mecánicos y Afines de Ibarra. The system will show the following modules:

1) ***Module of user's management:*** It allows to control the access to the system to authorized users, with managing of roles, limitation of access according to functions associated with the role.

2) ***Module of treasury****:* It will register information corresponding to income and expenditures that information includes of sponsor, donations, monthly collections, inscriptions to events, expenditures for basic services, expenditures corresponding to events, and will allow the emission of the respective reports per period.

3) ***Module of members:*** It will store information of partners and managers, also assistances to obligatory events, and the digital support of documentation.

4) ***Module of events:*** It save information of sports, social and juridical events, with their financial information.

5) ***Module of trainings****:* It will store information of trainings with his respective process of inscription, managing of assistance and emission of certificates.

6) ***Module of communications:*** It allows the management of communications got for external entities with the corresponding storage of digital trades.

7) ***Module of audit of database:*** It registers modifications to sensitive information of the tables of the database realized by the users of the system.

8) ***Module of reports:*** It obtains reports according to the needs of the user and to the information stored in the rest of modules.

D. Justification

A system of management of information is necessary for any entity that guards his information of a not organized way and that handles manual records.

Gremio de Maestros Mecánicos y Afines de Ibarra presents a deficient processing of information and management of activities; for this is difficult to obtain statistics and to generate of reports. Is observed that one of the principal barriers to improve the process of communication and treatment of information of an organization is not to have a suitable system of management; a manual method cannot replace the facilities that the technology offers to us on having allowed the saving of time and the decrease of costs, simultaneously it helps to a choice of decisions more succeeded so the available information is updated and opportune.

The implementation of the web system will allow a processing efficient and structured of information of the entity, will facilitate the obtaining of results and reports on the basis of a tidy and reliable storage, being an economic contribution on having facilitated the execution of internal processes, having provided safety in the record of financial information and in consequence to achieve the saving resource and efforts.

The web system will contribute also with the environment on having automated tasks that nowadays are realized and control of manual form, diminishing significantly the managing of physical records and the use of paper.

II. Development tools

The tools used in the development of the information system are specified below:

A. Yii Framework

Yii2 makes agile the development of all type of system with the generation of code using Gii tool. In addition it implements safety and access configurations with the component AccessControl, facilitates tasks of design with Bootstrap, simplifies the sending of e-mails with SwiftMailer and includes more functionalities installed by fault.All these characteristics represent an important contribution for the developer, in terms of time and effort, especially if it is a system that integrates great quantity of processes since it allows an approach of resources in the programming of specific functionalities, leaving of side generic characteristics [2].

B. Netbeans IDE

Netbeans is a platform of development that allows the construction of web, mobile applications and of office. “The languages of programming supported by Netbeans include Java, C, C ++, PHP, HTML and JavaScript” [3].

It is a free software and of opened code, multiplatform, it needs the installation of Java Development Kit in the operating system. It makes the integration of characteristics possible across the addition of plugins, in case of PHP, allows the use of frameworks as Yii, Symfony, Laravel, between others [4].

C. MySQL database

MySQL is a system of management of relational database distributed by Oracle. It has a free version under public general and opened code license named Community Server. It allows the administration of database with the storage of information in structures to add, to visualize and to process information of an organized way. It stands out for his facility of use, rapidity of implementation and free distribution [5].

“The API is available in C, C ++, Eiffel, Java, Perl, PHP, Python, Ruby and TCL.” [6]

III. Scrum Methodology

The traditional process used for project management some years ago was vertical and staggered, one was showing the time scheduling and activities across Gantt's graphs, in spite of that similar mechanisms already had failed in other fields; the disadvantage of this process is in that the established planning does not contemplate the possibility of unforeseen situations, causing inevitably delays in the initially established times, even if the equipment has invested a lot of time in the above mentioned planning [7].

The methodology SCRUM arises to overcome these problems, is applicable not only to projects of software development; across periodic reviews it tries to determine if it is fulfilled by the planning, if the used mechanisms work, if what is created is what the client wants, according to this it should determine if it is worth a sorrow continuing doing it of the same form, or if it is necessary to modify something to make it better. Evaluation of product that develops and the processes executed for Scrum basically is a process of evaluation and

cyclical correction, which gives like proved products that satisfy the needs of the client and equipments with major performance [7].

Scrum's roles were assigned in the present project as the table 1 indicates.

TABLE I
SCRUM'S ROLES

ROL	NAME	FUNTION
Product Owner	Tnlg. Ludwig Radrigán President GMMAI	Check that the functionalities of the system adapt to the requirements of the entity.
Scrum Master	MSc. Mauricio Rea	Check and to facilitate the advance of the development of the system, also SCRUM's correct use.
Equipo Scrum	Eliana Farinango	Develop the system according to the specifications and requirements established by the Product Owner.

Fig. 1 specific Scrum's phases and the tasks involved in each one.

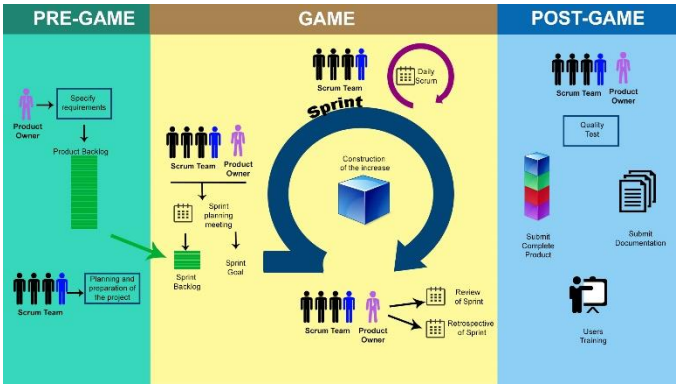

Fig. 1 Phases of the SCRUM methodology

A. Pre-game

Phase in which the tasks are established to executing in the product backlog, the number and approximate duration of every Sprint, also the assignment of tasks that might be completed in every iteration [8].

In the Fig. 2 the project planning decides, shows start date and end date of every sprint, considering days of work of eight daily hours for five days a week.

ID	ITERATION'S NAME	PERSON IN CHARGE	START DATE	END DATE	DAYS	HOURS
S0	Analysis and planning of the project	Eliana Farinango	29/05/2017	07/07/2017	30	240
S1	Management of members	Eliana Farinango	31/07/2017	25/08/2017	20	160
S2	Management of Treasury	Eliana Farinango	04/09/2017	06/10/2017	25	200
S3	Management of Events	Eliana Farinango	30/10/2017	22/12/2017	40	320
S4	Management of Courses and Trainings	Eliana Farinango	08/01/2018	03/02/2018	20	160
S5	Management of Communications	Eliana Farinango	12/02/2018	23/02/2018	10	80
S6	Management of Access and Security	Eliana Farinango	26/02/2018	27/03/2018	25	200
S7	Audit of Database	Eliana Farinango	02/04/2018	50/04/2018	18	144

Fig. 2 Planificación del Proyecto

B. Game

As soon as one has determined roles and responsibilities of the project and start date and end date has been established for the iterations, the following step is the phase of game, in which one develops the increases of product according to the iterations established in the planning of the project; every iteration has his respective detail of tasks to achieve the fulfillment of the assigned requirements [9].

The software develops across the execution of a series of iterations to come in conclusion of the complete product. There are done meetings of planning and review in every Sprint [8].

C. Post-game

The software has been completed and can put in production, the training and submit of documentation is realized [8].

IV. RESULTS

A. Metrics of quality in use according to the norm ISO/IEC 9126-4

The survey of satisfaction applied to itself according to the metric ones of quality in use specified in the norm ISO/IEC 9126-4. "The quality in use metrics measure whether a product meets the needs of specified users to achieve specified goals with effectiveness, productivity, safety and satisfaction in a specified context of use. This can be only achieved in a realistic system environment" [10].

"Effectiveness metrics assess whether the tasks performed by users achieve specified goals with accuracy and completeness in a specified context of use" [10]. The selected effectiveness metrics are specified in the Table 2.

TABLE II
EFFECTIVENESS METRICS OF THE NORM ISO/IEC 9126-4

Metric name	Purpose of the metric
Task effectiveness	What proportion of the goals of the task is achieved correctly?
Error frequency	What is the frequency of errors?

"Productivity metrics assess the resources that users consume in relation to the effectiveness achieved in a specified context of use" [10]. The selected productivity metrics are specified in the Table 3.

TABLE III
PRODUCTIVITY METRICS OF THE NORM ISO/IEC 9126-4

Metric name	Purpose of the metric
Task time	How long does it take to complete a task?

"Satisfaction metrics assess the user's attitudes towards the use of the product in a specified context of use." [10]. The selected satisfaction metrics are specified in the Table 4.

TABLE IV
SATISFACTION METRICS OF THE NORM ISO/IEC 9126-4

Metric name	Purpose of the metric
Satisfaction questionnaire	How satisfied is the user with specific software features?

The Table 5 shows the list of questions associated with the referred metrics of quality in use.

TABLE V
ASSIGNMENT OF METRICS OF QUALITY IN USE TO SURVEY OF SATISFACTION

Question of survey of satisfaction	Referred metrics
Do you like the design of the system?	**Satisfaction:** Satisfaction questionnaire
How difficult is it the navigation in the system?	**Satisfaction:** Satisfaction questionnaire
Do you think that the system is easy to operate?	**Satisfaction:** Satisfaction questionnaire
Do you think that the times of execution of the operations have diminished with the implementation of the system?	**Productivity:** Task time
How fast are operations completed in the system?	**Productivity:** Task time
Qualifies your level of satisfaction with the modules of the system	**Satisfaction:** Satisfaction questionnaire
How reliable does he consider to the system? (The system is not reliable if it loses information, it does not answer or it has mistakes)	**Effectiveness:** Task effectiveness
With that frequency has found problems in the use of the system?	**Effectiveness:** Error frequency
How understandable is it the information showed in the system?	**Satisfaction:** Satisfaction questionnaire
How easy is the generation of reports in the system?	**Effectiveness:** Task effectiveness

V. CONCLUSIONS

1) There was demonstrated that the processes executed in the Gremio de Maestros Mecánicos y Afines de Ibarra, before the implementation of the Information system, were occupying great quantity of time and effort on the part of the persons in charge of every area when there was needed the emission of reports of a period of time or delivery of results that were involving more than one record, especially in areas assigned to Treasurer and Manager of Statistics, Organization and Discipline.

2) The methodology of development SCRUM facilitates to complete functional and deliverable sections of the system in short periods of time, also it makes possible to document the process of development of easy, simple and structured form; it involves actively the owner of product in the process guaranteeing this way the delivery of a qualit system that satisfies the expectations of the final user.

3) The implementation of the system in the Gremio de Maestros Mecánicos y afines de Ibarra allows to reduce expenses in use of paper on having done without manual records; it helps to minimize times of execution of vital operations for the logic of business; it allows to assign and to restrict tasks to every role, motivating the users to completing his functions of an effective and opportune way; it supports a control of responsibilities on the execution of every action revealing processes.

1) Yii2 is a framework adapted to develop web systems in a minimal time and with few difficulty, incorporates generic totally functional characteristics and generation of code allows rapidly.

V. RECOMENDATIONS

1) It is recommended to the developer to interfere in the environment of operation of the entity to know and to understand the processes effected every day, in addition to learn the mechanism of execution of the daily activities in order to realize an effective raising of requirements, and also to manage to integrate effectively the functionalities that the entity needs in the technological solution that it is going to elaborate

2) It is recommended to use the methodology of agile development SCRUM in information systems that need rapid development and constant presentation of results, on the basis of the specific needs of the client.

3) It is necessary to involve the users of the institution in the process of implementation of the system across the incorporation in phase of tests and training, facilitating the introduction of the new technology and the utilization to the maximum of the benefits that it offers, reason for which is indispensable that all the modules of the system are in use in its entirety.

4) It is recommended to use Yii2 in information systems that implement great quantity of functionalities to reduce the time of programming; Yii2 in equipment with SCRUM they make possible that the project is completed rapidly.

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