ForistomApp a Web application for scientific and technological information management of Forsitom foundation

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Abstract. Information and Communication Technologies (ICT) are essential in the transfer of knowledge, and the Web tools, as part of ICT, are important for institutions seeking greater visibility of the products developed by their researchers. For this reason, we implemented an application that allows the information management of the FORISTOM Foundation (Foundation of Researchers in Science and Technology of Materials). The application shows a detailed description, not only of all its members also of all the scientific production that they carry out, such as technological developments, research projects, articles, presentations, among others. This application can be implemented by other entities committed to the scientific dissemination and transfer of technology and knowledge.

1. Introduction

The Group of Research of Development in Software Engineering (GIDIS) of the "Universidad Francisco de Paula Santander" and the Foundation Of Researchers In Science and Technology Of Materials (FORISTOM) worked together to develop a web application to facilitate the management and divulgation of Information of the research groups, especially FORISTOM information. Among other works between GIDIS and FORISTOM are the development of web applications for the calculation of the dose and the concentration of ions implanted in solid substrates and the development of a 3D simulator of a virtual laboratory where the ionic implantation processes can be studied [1-3]

The FORISTOM foundation aims to create appropriate scenarios where there is the exchange of creative ideas and the transfer of scientific knowledge of research and innovation in the area of science, engineering and technology of materials and the industrial applications, establishing a universal network of cooperation between research groups, universities and industries. The main purpose of the professionals who make up the FORISTOM Foundation, through the network of researchers in science, engineering and materials technology, this work automates their processes and make them known to national and international societies. In this context, it is vital that FORISTOM can have a web space with full autonomy where it can manage the information of the different scientific products, technological developments and innovations (projects, articles, papers, etc.) and enable it to contribute to the Transfer of scientific and technological knowledge. As a result of the above, arises the need to implement a web application that takes control of its processes and that

allows to obtain the information of FORISTOM in an efficient way and that in turn manages to make known the impact of this to the community.

As an antecedent to the research, it is worth mentioning the platform of the GIDIS research group of the UFPS, is a web platform of GIDIS that allows to the visitors access and obtain information corresponding to their events, news related to the research group, the lines of research they have, their members and projects [4]. On the other hand, The "Scienti" platform of "Colciencias" is the national level responsible for managing the information corresponding to research groups (category, researchers, articles, papers, research projects, lines of research) and individual researchers [5]. However, despite having all the necessary information, it does not provide a pleasant sight to visitors who are in search of information about a particular group or researcher. Neither allows generate reports or indicators of the production of the group that allow better management. Therefore, ForistomApp is an information system created to record, collect, organize, distribute and improve the visibility of the projects and products created by the Foristom Foundation. Although the initial idea is that ForistomApp is used by the Foristom Foundation this can be parameterized and suitable to any research group.

ForistomApp was implemented using the Sandbox - UFPS platform created by the research group GIDIS, this platform offers a set of tools for the development and deployment of web applications in an easy and automated way in the cloud [6]. ForistomApp is a Rich Internet Application (RIAs) characterized by a common goal of adding new capabilities to the conventional hypertext-based Web. RIAs combine the Web's lightweight distribution architecture with desktop application's interface interactivity and computation power, and the resulting combination improves all the elements of a Web application (data, business logic, communication, and presentation) [7]. It is also a responsive web application that can be used from any device (tablet, cell phone or computer).

2. Development methodology

The FORISTOM Foundation has not a web application that is robust enough to cover all the processes it performs, they have not a reliable page that allows access to reliable information about its projects and research. Knowing this and taking the year 2017 as a reference, it is indispensable that this foundation has its application and can thus automate its processes. It is necessary to have technological support to make the production of the group more efficient and place it in a place in cyberspace so that it can be consulted, thus generating greater visibility and impact towards the national and international community.

For the development of this application, the OpenUp methodology [8, 9] was taken as a reference and the stages of planning, monitoring and control were added. In addition, feedback activities were added at the end of each iteration. The development of the software product is performed through the life cycle known as incremental iterative, which consists of three (3) iterations for the total coverage of product development.

The project began with the compilation of the theoretical foundation that serves as the basis for the beginning of the research process, after which the functional and non-functional requirements of the information system were identified to manage the data corresponding to the FORISTOM foundation (projects, users, events, etc.). This list of prioritized requirements of the product, which acts as a project plan, is provided by the legal representative of FORISTOM foundation, it prioritizes the objectives, balancing the value they bring, being distributed in iterations and deliveries. Once the requirements were obtained and the user's needs were analysed, the team of development proceeded to the design of the graphical user interface, describing the architecture of the information system and the development of the back-end of the system, which is evaluated in the next phase to verify that it really complies with what the final consumer wants.

After each iteration, the monitoring and control process is carried out, resulting in a software version with new functions ready to be used, thus adjusting the prototypes of the application already built, and adds new functions always prioritizing those that bring greater value to the business.

The iterations consist of the following phases:

- Iteration planning: consists of identifying the specific requirements of the iteration, as well as identifying those that are priority.
- Start: in this phase the use cases are made and a sketch of the user interfaces is made.
- Elaboration: The purpose of this phase is to establish the architecture of the software, as well as the definition of class diagrams, conceptual and data.
- Construction: in this phase the use cases are implemented, and the user manual for the iteration is developed.
- Transition: The iteration test plan is executed, debugging found faults and testing implemented corrections.
- Monitoring and control of the iteration: the purpose of this phase is the review of progress in each activity, as well as the reports, their arrears, compliance and feedback.

3. Results

An application was developed that allows the FORISTOM foundation to have control over its members, registering in the application and allowing its projects and products to be published. The application will have an administrator, who will have control over the information of the group on the page, being able to edit the corporate elements such as the mission, vision and research lines, also can manage the news and events of the group. The Figure 1 shows the system map, including all the pages integrated in the application and its dependency.

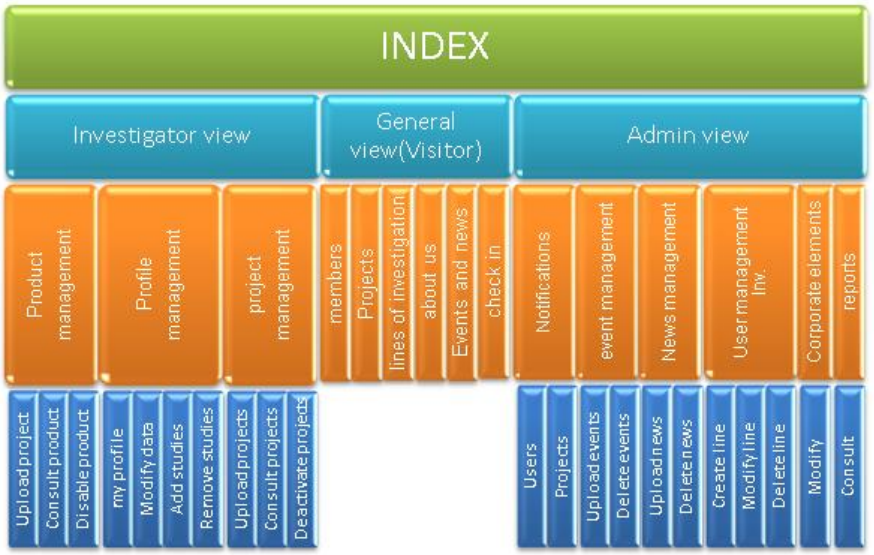

Figure 1. ForistomApp navigation map.

In the proposed solution, the model-view-controller architecture is implemented, together with the façade pattern. The Model View Controller (MVC) is a software architectural style that separates data from an application, user interface, and control logic into three distinct components. This model has proven its validity over the years in all types of applications, and on a multitude of languages and development platforms [10,11].

- The Model: contains a representation of the data that the system handles, its business logic, and its mechanisms of persistence.
- The View, or user interface: composes the information that is sent to the client and the mechanisms of interaction with it.

- The Controller, which acts as an intermediary between the Model and the View, managing the flow of information between them to adapt the data to the needs of each one [10,11].

For its part, the façade pattern is a design pattern that simplifies the communication between two objects of the system [12,13].

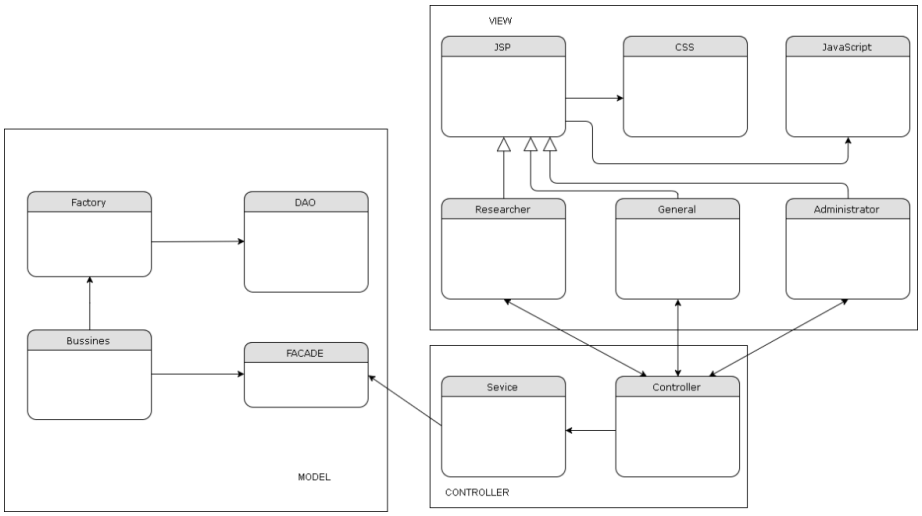

Figure 2. ForistomApp system architecture.

When you enter ForistomApp you will be presented with the overview (see Figure 3), the navigation is done through the menu at the top of the page, where the visitor can access the information shared by the research group. The users of the application can consult projects, news, events, products, research lines and corporate information of the group. All this content will be available in the corresponding top menu items. Also at the top you will find the options Login and Register. For log in, the user must belong to the group and have a user created and have been accepted by the application administrator. Otherwise, you must register by completing a form, entering the relevant data, and waiting for the acceptance by the administrator.

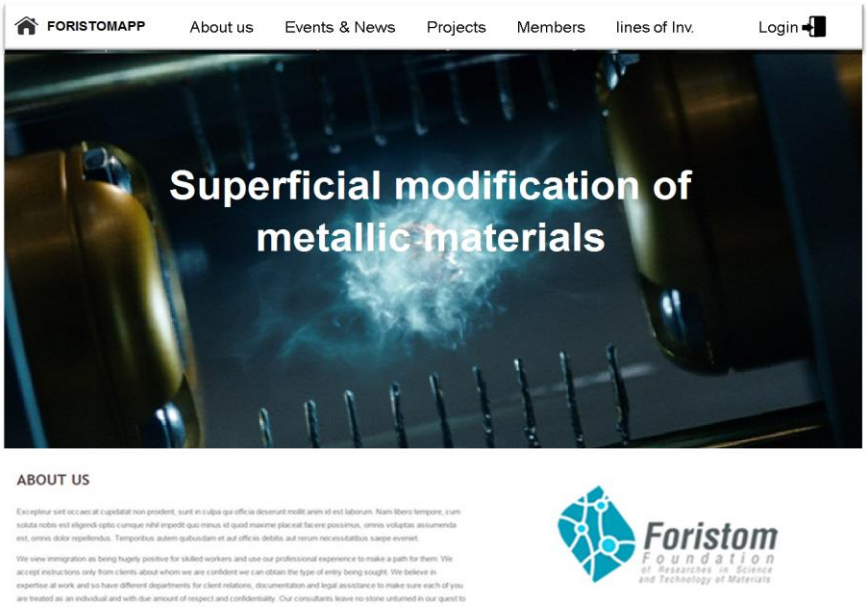

Figure 3. General view ForistomApp.

Once the user has logged on as a researcher (see Figure 4), the user can access his profile and his options to manage the information as a researcher, available through a side menu. From this view the researcher can manage all his personal information and the projects that are advanced within the research group. This one also has the possibility of administering its studies with the title, year of completion and institution.

Figure 4. ForistomApp research view.

The administrator's view (see Figure 4) allows the leader of the group or in charge of the web application, to manage the publications, that is, to accept or reject these according to their criteria and, if these are approved, these will be presented in the overview. It also has the ability to administer the researchers; this includes admitting or rejecting users and deactivating them when one of the members leaves the group. This view also allows the application manager to detail the corporate elements of the group (mission, vision, corporate objectives) and the research lines of the group either active or inactive. This view is the most influential in the application because it depends on the information presented to the public is reliable.

The administrator can generate reports so that the community can know the products developed per month and products of each researcher. In this way, we have the detailed production information of the group that displays the information in real time. Researchers may also have a more orderly handling of their products and they will be able to make known the result of their work. ForistomApp can also be parameterized in corporate colours, logos, images and static information, adapting to different research groups, the administrator can manage the application through a friendly interface. The web application was develop using bootstrap for responsive systems [14].

4. Conclusions

Software as an information management tool of a research group is indispensable, ForistomApp, allows to detail the production of a group, to carry detailed reports of the projects realized and that are advancing. It allows the users to visualize the products developed by the group members with the necessary information. In addition, it is a flexible application that allows the parameterization of corporate colours, logos and static information, making it easily adaptable to any research group.

The construction of the web application ForistomApp, for the Foristom foundation will improve the management of its processes allowing them to take control over their internal tasks and an inventory of people of the group as well as their production.

The web application allows the Foristom foundation to be more accessible to the general public, because anyone can see all their production online facilitating that the whole community can accede to it and not only the circle of investigators allowing to download documents elaborated by the working groups and to read in detail the results of the realized investigations.

The Foristom foundation will be known nationally and internationally thanks to the visibility that will be granted by the ForistomApp application, as this is an end user friendly page and with truthful and reliable information provided by the group members and validated by the site administrator.

The web application ForistomApp integrates the collaboration of the research groups in Colombia with information and communication technologies, so that this last one is a constant support to the research processes in the country allowing to detail the products obtained by the investigations carried out, showing monthly reports or in dates ranges established by the administrator, revealing the quantity of products obtained by researchers.

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