

Scientific
Journal of
**Applied
Social and
Clinical
Science**

**THE USE OF DIGITAL
AUTOMATION TO SPEED
UP PROCESSES AND
SUPPRESS ERRORS IN
THE EXECUTION OF
ROUTINES**

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Abstract: Automating and, consequently, exchanging manual tasks for software is essential in today's society. Several activities that are performed on a day-to-day basis can be automated in order to reduce effort, time and human error due to the exhaustion of repetitive work. Identifying and correcting these failures are functions that an automated system performs in order to maximize results. It is known that since the period of the Industrial Revolution (18th and 19th centuries), manual work has been replaced by machines and automated programs in order to streamline and improve processes, mainly through the use of new technologies. In this context, IFIntegra aims to integrate the *IFPublica* digital library of articles and the Digital Platform for Registration, Project Management and Environment Integration (PDIAPIA), through adaptations in both projects, to prevent human errors and automate the process of registration of PDIAPIA articles in the IFPublica database. With the development of this *software through* a web *service* developed with the PHP programming language and a client software developed with the JavaScript programming language, it became possible to automate the task with the expected quality and efficiency.

Keywords: Streamlining of processes; automatic insertion; easy inclusion layout; program interconnection

INTRODUCTION

PDIAPIA is a platform for registration, project management and integration of environments which, in turn, was used to include projects in work exhibitions on an IFSul campus. However, PDIAPIA was developed to allow other campuses to use it at their local fairs as well. This project started in 2016 and continues to be used to register new projects. It is important to note that this system is available for online access and has

been constantly improved.

In addition to allowing the inclusion of projects, PDIAPIA allows their selection (approval or disapproval), as well as making it possible to mark the presence of students and coordinators. With the presence marked, the user can generate and issue their certificate of participation through this *software*. In addition to attendance, other certificates can be issued, such as project guidance, awards, participation in events that took place during the work show (workshops, academic week, seminars, among others).

The IFPublica project, on the other hand, was implemented to act as a digital library, through the dissemination of technical and scientific productions. In this way, people interested in this collection can access the tool to search for documents *online*, as they would be available in the public domain. This makes it possible to expand the dissemination of projects presented in a work exhibition (or science fair). Therefore, in addition to preventing the work from being unregistered (forgotten), the tool can prevent the same or very similar projects from being developed.

Currently, to update the database, manual and technical insertions, through SQL commands (database manipulation language), are necessary, requiring the user to have knowledge of the language and the database. This manual and repetitive operation may cause the responsible person to enter incorrect or incomplete information. To partially solve this problem, a screen was created to export this information, preventing the administrator from needing knowledge in SQL and taking all the data in the correct format to the destination database in IFPublica.

In this context, the automation process (integration) becomes interesting and of fundamental importance, since the data of the projects registered in PDIAPIA should be sent to IFPublica. In this way, the virtual library

would be constantly updated, automatically, to optimize time and prevent errors. In addition, the integration process allows IFPublica developers to focus on other activities to improve the tool, avoiding wasted time due to manual entries.

Thus, it can be concluded that through IFIntegra, the PDIAPIA and IFPublica platforms can become more efficient and attractive, precisely because they are updated and integrated.

RATIONALE AND METHODOLOGIES USED

Initiated in England in the 18th century, the Industrial Revolution emerged with the aim of replacing the manufacturing technique used until then by automation processes within industries (FERREIRA, 2001). The automation of these processes frees man from repetitive work and allows him to focus his efforts on other activities, saving him time and reducing the incidence of failures in what he is producing.

And, since then, we are increasingly familiar with automated systems, which were created to make our lives easier, requiring only that they be controlled, maintained, repaired, supervised and programmed by a human (VILELA et. Al, 2003).

In this way, the integration of the PDIAPIA and IFPublica platforms becomes important, as it avoids repetitive and time-consuming work, as well as preventing errors from being made through overly manual and technical work. As a result, the proposed project, called IFIntegra, aims to integrate both platforms, through the automated sending of data from PDIAPIA to IFPublica. In this context, it is necessary to study and understand the technologies used in the development of both projects.

PDIAPIA was developed using several technologies, such as: MongoDB, Express,

AngularJS, and Node.js. These tools are based on the JavaScript programming language, widely used for defining the behavior and interfaces of web pages. MongoDB is used as a system for the database, where information from the user while using the platform is stored. MongoDB stores information in the form of BSONs, which are JSONs in binary format. Data is stored in this way to facilitate transport between applications and simplify use in other parts of the same platform, since JSON is the format in which *JavaScript* stores data, interaction with other tools based on this same language is facilitated.

Another tool used is Node.js which allows the development of Web servers and is used as the programming of the platform itself when it is used. Express is used to facilitate the communication of the database with the developed web server, since it is a *framework* for *web* applications. Finally, AngularJS is a framework used for the part of a platform that is presented to the end user, defining it as a front-end framework, that is, visible to the end user (HOLMES, 2013).

IFPublica also makes use of the JavaScript programming language for the development of its web pages. However, this project was also developed with other technologies, such as: HTML, CSS, MariaDB and PHP.

It is important to note that HTML (Hypertext Markup Language) and CSS (*Cascading Style Sheets*) are two technologies developed for building web pages. HTML provides the structure of the page, and CSS provides the visual and auditory layout of the page, for a variety of devices. Along with graphics and *scripts* (sequence of steps or commands interpreted by a system), HTML and CSS are the basis of building pages and web applications (W3C, 2018).

PHP (PHP Hypertext Preprocessor) is a scripting language, whose code is open (open source) and of general use, widely used, and

especially suitable for web development and that can be embedded within HTML, helping in the construction of the page (PHP DOCUMENTATION, 2018). In conjunction with these tools, MariaDB was used, a fork (derivation) of MySQL, open source and free (MARIADB DOCUMENTATION, 2018) that acts as a database, storing all project information from the IFPublica platform. Therefore, the study and understanding of these technologies is of fundamental importance for the development of IFIntegra (integration of data from PDIAPIA and IFPublica).

With the partial development of IFIntegra carried out in 2018, a web service software implemented in IFPublica, a client software for the integration of PDIAPIA with the IFPublica web service, as well as PHP pages to assist in the use of the web *service* were also adopted as technologies. and the use of the Ubuntu Server operating system for testing the developed *software*, since both PDIAPIA and IFPublica run on this type of operating system.

As for the methodology used, several steps were carried out to organize the objectives to be met, because of this in a first step it was necessary to analyze the current situation of the PDIAPIA platform (Digital Registration, Project Management and Environment Integration Platform), of the database of the IFPublica digital library of articles. Then, a research step was essential, to better understand the tools used in the development of both platforms. Therefore, it is necessary to learn and improve knowledge about MongoDB, Express, AngularJS, Node.js, JavaScript, PHP, HTML, CSS, MariaDB and evaluate other possible technologies that could have been used in the implementation of both systems.

In addition to the above studies, it was also necessary to research new technologies

to be used in the development of the integration platform (IFIntegra), considering the compatibility between these tools. This allowed the implementation of prototypes to jointly determine which technology should be used in this new tool. This step allowed tests to be performed to determine the tools to be used, considering visual and implementation aspects.

With the beginning of the development stage, registration screens were created for manually entering information. Thus, preventing the virtual library from being fed directly by SQL commands and preventing some invalid information from being inserted, as well as allowing possible adjustments to the data to be performed. Aspects of responsiveness were observed at this time, aiming at a good visualization, regardless of the device and operating system used by the end user.

In parallel, the development of integration between the platforms began. In this way, the concepts studied were applied to allow automation between the tools. It is known that this step is fundamental, as it determined the success of the application. Therefore, this phase required more time and attention.

Along with the development stage, a permanent testing stage was necessary, where the functioning of the system is constantly checked. In order to prevent developers from testing only what they have implemented, it is important that the person responsible for developing the registration screens checks the correct functioning of the integration and vice versa.

Closing the development, it is necessary to focus on feeding the tool, that is, ensuring that the information available on the PDIAPIA platform is sent to the IFPublica digital library of articles. At this point, another testing phase is essential, to verify that the information has been correctly integrated. A

malfunction at this stage can lead to rework in the development stages.

Another crucial point is the system documentation, in which the table structure changes must be altered in the existing documentation, as well as the new functionalities also need to be properly documented to facilitate a future improvement and understanding of the systems. Recording this information is essential before development to determine what will change, as well as during and after implementation to inform what was accomplished during the integration process.

RESULTS AND FINAL CONSIDERATIONS

After research and studies on integration technologies between platforms and *softwares*, it was determined that it would be wiser to develop a *software web service* to transfer data

from PDIAPIA to IFPublica.

A *web service* it is a *software* developed with the objective of integrating systems developed with different technologies, that is, that do not communicate natively. It operates through the *web*, using the *HTTP* protocol to establish communication with the client software that will consume the *web service*. The *web service* was developed to operate together with IFPublica, which is built using the same platform technologies. Meanwhile, the client software was built with the same technologies as PDIAPIA, to work together with it.

In this sense, the web service and the client software play a kind of bridge between the two platforms, communicating through *JSON* files, files that both technologies understand, making communication viable despite the discrepancies between the technologies used in the development of the two platforms.

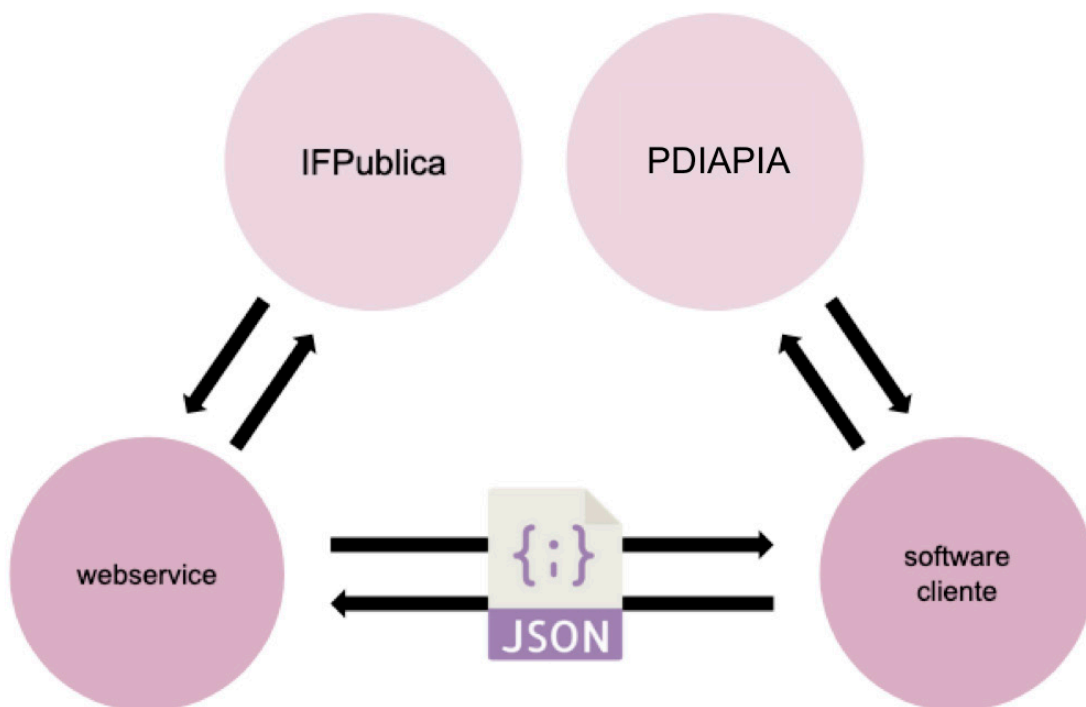


Figure 1 – Integrator working diagram.

Source: The authors.

The integration methodology using a web service also enables the development of new integrations with other platforms for recording pedagogical productions. Because the web service and the client software are not a single software, but two distinct ones that only establish communication with each other, operating independently, they make it possible for other platforms to only develop a client software for the same and that adapts it to the standards of web service communication and, thus, data communication and integration will work correctly and automatically, making integration with new platforms easier, faster and without errors.

With the development of a prototype of the web service and the client software, it can be seen that the integration of data between PDIAPIA and IFPublica works correctly and

quickly as expected, different from the manual insertion process carried out until then, which took days to complete, this integration process takes seconds to complete and has a very low error rate compared to the previous method.

However, despite the method being extremely reliable and infrequent errors, as a precautionary measure, a web page was developed in parallel to the integrator, using the same technologies as IFPublica, which allows the manual insertion of data in the digital library in a more efficient way. intuitive than the one previously performed, so that it can be used in cases in which the automated integrator is not able to fulfill its role, working as a contingency for specific cases until the problem that made its use is treated.

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