RESEARCH ARTICLE

Design of a web-based system for the registration of grades in a school

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Abstract: Currently, some public institutions do not have the necessary technology to record grades, attendance and conduct, and this is affecting schools and parents when it comes to getting their children's grades because mistakes tend to occur when entering grades or attendance manually, and not having a virtual system where the filling of grades is done, where they can offer security, time savings, and easy accessibility for parents. Thus, we designed a prototype as a web system design that meets the requirements required by the institution. It was developed with the Scrum methodology as an agile development framework for software creation. As a result, designs according to a web system complying with the procedures and requirements established by the Scrum team give a basic proposal and a productive approach for the development of the web system within the processes of grades registration, attendance and student behaviour. Therefore, an institution can implement this proposed web system design in the future.

Keywords: framework, MySQL, Scrum methodology, web system

1 Introduction

Technology has recently become indispensable for private and public institutions (Skaraki & Kolokotronis, 2022). However, most state schools do not have systems to streamline and improve the manual entry and grade recording, attendance and student behaviour control (Daily et al., 2019).

For the reasons mentioned above, Kumamoto I School has many problems in the administrative area affecting grades recording. Furthermore, another problem is the duplication and loss of information and the delayed delivery of grades (Kallou & Kikilia, 2021). This problem has been going on for a long time, as manually registering grades takes a long time, resulting in delays in students knowing their grades (Yeager et al., 2019).

On the other hand, the problem of student behaviour control becomes chaos when informing parents because a teacher must search sheet by sheet until he finds the specific student (Kikilias et al., 2009; Papadakis, 2022). Many parents want to know why their children's behaviour is essential (Papadakis et al., 2021). Also, attendance is an excellent waste of time in class for teachers (Yeager et al., 2019). Furthermore, a teacher can lose information by having too many sheets of students' different courses and grades (Verawati et al., 2022). For this reason, the most feasible solution is for an institution to create a web system for the streamlining and security of students' information, as well as having attendance and control of conduct (Ceylan & Kesici, 2017).

The technical justification and the use of I.T. (Information Technology) become a great advantage for the institutions as tools to streamline processes (Kapaniaris & Zampetoglou, 2021; Papadakis & Orfanakis, 2018). In the present study, there is no platform to improve the recording of grades, attendance and behaviour control (Konstantopoulou et al., 2022). This research seeks to reduce the time it takes to carry out this process, in addition to improving the attention of the student's grades. Economically, the system was developed by free programs, which benefits and reduces costs compared to other commercially systems and products (Papadakis & Kalogiannakis, 2019). So the information will be communicated on the platform, and reducing parents' consultations will benefit the educational community by monitoring grades and student behaviour (Papadakis, 2021).

In the social aspect, the system is focused on parents' follow-up of their children with grades, attendance and behaviours. A disadvantage is that it requires the Internet to access the system, but it is adaptable and easy to understand. Another factor is the information recorded in the grades is accurate, thus allowing access to students and parents (Papadakis et al., 2021).

This article aims to implement a web-based system to improve grade recording and control student behaviour. This paper is structured as follows: in section 2, the literature review; in section 3, the methodology will be described in detail; in section 4, the case study; in section 5, the results and discussions and in section 6, the conclusions.

2 Literature review

The work of Cayetano Mancha Condori Capani entitled "Intranet model to improve the quality of service (QoS) of the data network in the, I.E. J.E.C. Tupac Amaru Lircay - Huancavelica", proposes that the use of technology is something indispensable these days. This is why systems are developed to the institution's needs, which effectively manage information (Comunicaciones et al., 2018).

The work of Quispe Lourdes entitled "implementation of a web system for the improvement of the educational, administrative process of the educational institution Wari- Vilca-Huayucachi" mentions that technology advances and improves in every era. This is why many institutions want to improve their system. Information technology can help modify the development and implementation of a web system for institutions (Quispe, 2018).

To examine the design and implementation of a didactic prototype of active learning intranets: a strategy to mitigate the digital divide in the training centres of the northeastern Amazon (herein after P.D.A.A.), a study was conducted in Colombia. It collected the information required in the F.P.I. process that validates students' learning outcomes. This is a strategy for developing a training project to create an intranet network (Lacuesta et al., 2009).

The paper "Barriers to the Introduction of I.C.T. Into Education in Developing Countries: The example of Bangladesh" recommends using technology to support educational objectives such as grade assessment skills, cooperation and communication. It also mentions that teachers are already confident in using web-based systems to facilitate the process of recording grades and taking attendance (Khan, 2019).

Finally, several ideas were obtained to implement the proposed research work since each author used different methodologies and obtained different results (Tzagkaraki et al., 2021).

3 Methodology

To realize the web system, we used the Scrum methodology, which is an agile methodology for developing systems or software. We followed the following phases to apply it, as shown in Figure 1.
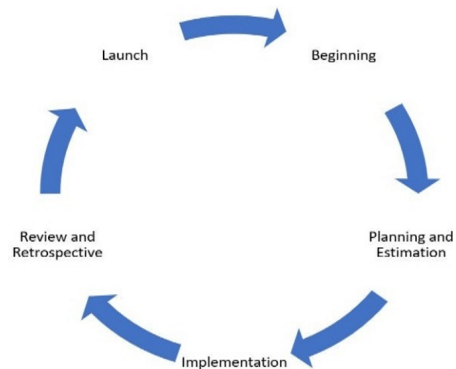

Figure 1   Phases of Scrum methodology

3.1 Start

The first phase is developed in the project's analysis and study by identifying the customer's basic needs, called sprint. The questions asked at the beginning of the phase are:
(1) what do I want?
(2) How do I want it?
(3) When do I want it?

3.2 Planning and estimating

The second phase is generally developed with the following steps:
(1) Creation and estimation of user stories.
(2) Identification and estimation of tasks.
(3) Creation of the sprint backlog.

3.3 Implementation

The third phase is holding meetings to discuss the sprint and optimize the scrum teamwork to shape the project. The following steps should be followed:
(1) Creation of Deliverables
(2) Daily stand-up performance
(3) Refinement of the prioritized backlog at the product level

3.4   Revision and retrospective

The fourth phase is the review of the process, practically the internal evaluation or self-criticism of the team concerning the project. The most important steps are:

(1) Demonstration and validation of the sprint

(2) Sprint Retrospective

3.5   Launch

The fifth phase, which would be the launching, refers to the conclusion of the work and delivery of the product, where two steps must be fulfilled:

(1) Shipment of deliverables

(2) Submission of the project retrospective (Hussain et al., 2018).

3.6   Case study

In this section, the research study will be developed by applying the mentioned methodological phases, respecting the procedure mentioned in the previous point.

3.7   Start

Requirements: The requirements are the part where all the system information is compiled by the institution's owner for the operation and how it will be visualized. Table 1 shows the requirements that were obtained.

Table 1   Requirements

No.	Item
1	The system must be able to log in with a username and password
2	The system shall be able to manage student grades, behaviour, attendance, etc.
3	The system will be able to register students for each section and grade
4	The system will be able to record student grades
5	The system will be able to record a report on the student's behaviour
6	The system will be able to record the student's attendance

Product Backlog: The detailed list of requirements previously obtained by the institution's owner. Table 2 shows the user stories, the priorities and the estimates of each to evaluate them (Sedano et al., 2019).

Table 2   Product Backlog

No.	Item	Priority	Estimate
1	As a user, I want to log in with a username and password	High	3
2	As an administrator, I want to manage student grades, behaviour, and attendance.	Medium	2
3	As an administrator, I want to register students for each section and grade level.	High	3
4	As an administrator, I want to record student grades	High	3
5	As an administrator, I want to register a report on student behaviour	Medium	2
6	As an administrator, I want to record student attendance	Medium	2

Another more important cause is the lack of empathy between teachers and students. It is essential to generate a friendly bond in the classroom. A survey of parents noted that teachers often fail to generate a friendly bond with their students. A student with disability hugs a teacher, which means a teacher has the confidence necessary to socialize (Jansen, 2018). A fourth cause is the location of educational institutions; finding a general education school is much easier than finding a special one. If they find one, it is too far away for most people with disabilities. Because technology is not being used to favour the student performance of children with special needs, it generates a significant problem since technology can be implemented during teaching and learning (Early et al., 2017).

Estimate - Planning Poker: Planning poker is the estimation and determination of the effort given to each user story, as shown in Table 3.

Table 3   Planning Poker

No.	Estimate	Weather
1	3	Three days
2	2	Two days
3	3	Three days
4	3	Three days
5	2	Two days
6	2	Two days
7	3	Three days

3.8   Planning

Sprint Planning Meeting: The necessary activities are performed to develop a new product version (Increment). The sprint (Deliverables) is established; through a tactical meeting of the project, it was decided that it will be developed in 4 sprints. Each sprint has two user stories previously established in this work, as shown in Table 4.

Table 4   Sprint Planning

No.	User History	No. Item
1	H1 y H2	1
2	H3 y H4	2
3	H5 y H6	3

Product Roadmap: The product roadmap is a high-level plan that allows us to see how our product evolves by testing the deliverable we developed. It is like a roadmap, which allows us to describe how we will achieve the objectives of the product to be delivered, as shown in Figure 2.
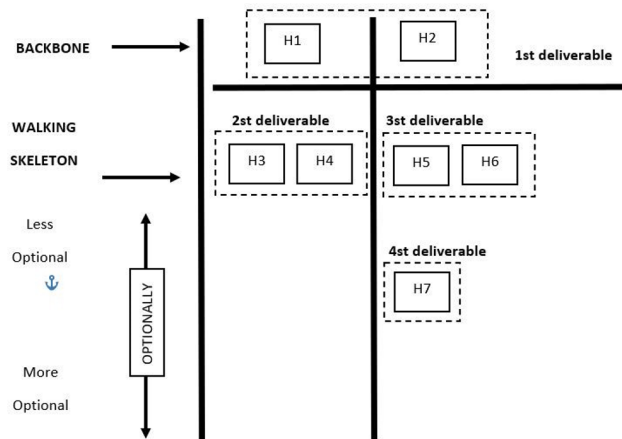

Figure 2   Product roadmap

3.9   Implementation

Sprint Planning Meeting: In this section, the elaboration of the activities is planned based on a sprint chronogram, where the dates where the deliverables will be given are determined. It will help the working group to keep order in the elaboration of the product.

3.10   Review and retrospective

Daily Scrum: All the people involved in the product will meet daily to verify the sprint and define if there is any problem that can be rectified or solved. The people involved in the meetings will take turns daily, every day, to show that the objective was achieved and elaborated typically and without any problem. We analyzed the possible problems that are found and do not allow for advance in the project.

3.11   Launch

Sprint I: It is based on the first deliverable of the product, which will show the system login to insert the username and password to access the system, and administrators will have access to grades, conduct and attendance of students. These features are essential for the system, so it was determined to be the first sprint.

Sprint II: In the second deliverable, the registration of students in their respective grades and sections and can also to record the students' grades are complementary to the first deliverable functionality.

Sprint II: The third deliverable applies the registration of a report of student behaviours per week, records students' attendance under their supervision, and then gives a report to parents.

Sprint IV: The fourth and last deliverable applies to the report of students' grades, behaviours and attendance to their respective parents with a search engine by the students' names.

4   Results and Discussions

4.1   About the case study

The study's main objective is to develop a web-based system for recording grades and attendance and reporting student behaviour, providing schools with new opportunities to monitor

attendance and grades through a web-based system via the Internet. The implementation of new ways to address parents' needs should include the acceptance of parents and the active development of information technologies (Mamolo, 2022).

This is an excellent way to take advantage of technology updates and adapt them to solve the problems that exist in the institutions. The prototypes' elaboration was developed thanks to a tool called Balsamiq. It is a design tool that allows us to adapt our design ideas into web products, which facilitates the creation of the system. Figure 3 shows a login design for teachers to record grades and for students to view their grades. Figure 4 shows the grade records of all enrolled students.

Figure 3 Login

Figure 4 Grade book

4.2 Analysis by Sprint

Sprint I elaborates on two functions: login of the system and access for administrators and their respective functions. Components will be implemented that will give a striking and novel visualization. The access to the functions will be elaborated with the functionality of permissions to the respective users. For example, the administrator will have the permission of total, where I will be able to register notes, attendance and student conduct.

Sprint II elaborates on two functions: registration of students with their respective grades and sections and the registration of grades. A basic form will be implemented for the registration of students with the necessary information that will be requested from the students. In the grades register, a list of the students will be shown, and some fields will be enabled to insert the students' grades.

Sprint III has the elaboration of 2 functions: registration of student's behaviour and the registration of at- tendencies. For the behaviour registration, a list will be shown, and a field to type some report of the student's behaviour. In the record of grades, a list will be shown with boxes to mark the student's attendance.

Sprint IV: It has the elaboration of a function that is: a report of the grades, behaviours, and attendance of the students, which will show a table with the general report of the student by searching for the name and surname of the student [12].

4.3 About the methodology

Advantages: One of the advantages of Scrum is to give a good organization and collaborative work of the working group members and quickly adapt to changes that may occur in the development of the product. In addition to having daily deliverables and not only at the end of the product, Scrum is also one of the most used methodologies currently and with great acceptance in universities to teach students and to carry out projects with this methodology (Morandini et al., 2021).

Disadvantages: One of the disadvantages of Scrum is that it requires knowledgeable people to manage large products and have adequate and accurate information about the methodology. Another disadvantage is that Scrum is often misused by development teams, as they are incapable or do not meet the standards and values that Scrum requires (Srivastava et al., 2017).

Comparisons: The agile methodology Scrum used in this project for the elaboration of the product Scrum is one of the methodologies that are currently widely used, and for them, it is becoming one of the best, providing several advantages for the company, besides Scrum is suitable for managing complicated projects (Vogelzang et al., 2020).

Scrum provides us with the steps to elaborate and control the process of elaborating software and products. This is why we will compare it with a traditional waterfall methodology, which

performs a procedural and rigid evaluation (Jurado-Navas & Munoz-Luna, 2017). It usually does not accept the interaction between processes and techniques by its rigorous arrangement. Usually, it does not give an adequate flow of information that allows knowing the customer's requirements integrally. With all the above, we can see the comparison in Table 5.

Table 5 Cascade Comparison – Scrum

Traditional methodology (Cascade)	Agile methodology (Scrum)
It has different stages	It consists of periodic deliverables (Sprint)
Does not accept any change	Can accept changes
Cost is determined during the planning	Cost is determined during the project
The development team is flexible with limited creative capacity	The development team is flexible with unlimited creative capacity
Sequential	Overlay

5   Conclusion

The entire web system was developed to improve the system of recording grades for the school 3092 Kumamoto I, to have ease and without confusion when inserting grades, attendance and student behaviours to address the existing problems in the institution. Furthermore, thanks to the technology that allows us to help the institutions. All this will be done thanks to the sublime text tool and MySQL, these interesting mechanisms that helped the ideas of the prototype take shape as they should. The methodology to be used in this web system will be Scrum, which will allow us to carry out the software in an organized and effective way at the time of its development. Essential functions limit it. Working further to focus on deeper modules and expand on enrollment and payment section development issues is recommended.

Conflicts of interest

The authors declare that they have no conflict of interest.

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