Designing and implementing an information management system for a non-public educational institution

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Abstract

This paper aims to document all the stages of the development of a management system for a non-public educational institution. Through the use of the latest literature and the qualitative method of data collection, this paper presents each element of the phases of the life cycle of the development of a system, based on the most efficient methodology, carried out concretely to meet the objectives and requirements presented by the selected school. The work's main goal is to design and implement an automated system based on the web, to replace the current system with which the school staff works daily. The reason is related to the problems encountered during the realization of various routine tasks, which are delayed, inefficient, inconvenient, and deficient in functionality. In addition to the loss of time, high possibility of errors, low level of cooperation and marked lack of transparency, manual management of the school process requires a lot of human effort and ongoing monetary costs. To help promote student achievement and success, the institution must have access to complete, accurate, and real-time information. Therefore, the proposed system, passing through the planning phase, the analysis of every data and report collected, the design of the prototype, and the development of the final product, is ready to be implemented in the school, achieving error-free, safe, reliable, and fast procedures.

Keywords: system, data management, development cycle, methodology, design, implementation.

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Introduction

The education system forms the backbone of any nation and therefore it is important to provide a strong educational foundation to the younger generation to ensure the development of open-minded global citizens. Since education is essential for development, it is considered one of the most powerful instruments in laying a foundation for sustainable economic and social growth. With this aim, our country for years has paid special attention to the education sector and activities for the improvement of relevant institutions, such as schools of different levels, from preschool to high school. To help promote student achievement and success, schools must have access to complete, accurate, and real-time information.

Unfortunately, public and non-public schools in our country still record data through paper-based documentation systems for conducting various studies and generating reports and information that administrators and other employees need to make routine decisions and more. The manual procedures of different tasks take time and may not be completely accurate, since some of the recorded data may be left uncalculated and taken into consideration, as an error on the part of the employee who is manipulating and using them or by the employee who may have performed the initial registration, not in the correct format. In addition to the problem of spending time and the possibility of mistakes, there is also the problem of transparency, since data can be manipulated without leaving a trace in the documents or, due to the lack of correctness on the part of the employees, they are not delegated to the people who should have access in them, such as a parent's knowledge of their child's grades. So, in other words, this manual system is not reliable, besides slow and not at all efficient.

Due to the problems of the current manual system, there is a need to automate it to efficiently handle every registration, update, and deletion of data, generate complete and fast transcripts and reports that satisfy the users and realize continuous communication, transparency in processes, and continuity in periodic updates. The motive for the realization of this work arose from the current situation of educational institutions. The desire to implement my knowledge in the field of development, to help improve management and coordination in schools such as the high school where I completed my secondary studies, prompted me to work on the design and construction of a computer-based management system.

The general and main objective of the project is the design and implementation of a web-based computer system for data management of "Preka College", to move from the traditional manual system to an automated one, significantly improving the process of data storage and data manipulation of this institution. To achieve the general objective, I aim to achieve these specific objectives:

- To record data accurately to increase transparency and efficiency throughout the necessary processes, thus reaching a management system without errors, that is safe, reliable, and fast.
- To create a large volume grouping with real and current data of the institution.
- To carry out quality communication with the database to generate reports in real-time and with high authenticity thus helping in the decision-making process.
- To build a specific profile for the role of the system administrator with full access rights, as well as a profile for students, teachers, and parents, with more limited access rights.
- Successfully carry out all the tasks and communications that will be assigned to each of the profiles by the real relationships outside the system, to emphasize once again the collaborative environment.
- Follow the activities of students and teachers through updates related to timetables, grades, exams, payments, announcements, or direct messages.

Literature Review

Manual system and automated one

Studies conducted (Leithwood, Patten, & Jantzi, 2010) on school effectiveness reveal that there is a long list of factors that determine its success. Marzano (2002) indicates that these factors are generally grouped into five categories, which are: guaranteed and applicable curriculum, challenging goals and effective feedback, parental and community involvement, safe and orderly environment, cooperation and professionalism of the staff (Tsereteli et al., 2011). Today, during the age we call the information age, the biggest risk an organization or institution can take is to remain "insensitive" to change. Many important factors such as continuous developments in information technologies, information exchange, growing expectations of society, perceptions, and modern management applications make organizations around the world develop new applications to survive (Shema, 2019). Public and non-public schools of primary and secondary education seem to need such applications now more than ever because every year they are faced with a very large number of data, the registration, manipulation, and transfer of which seems to take time and increases the potential for error if done through manual, paper-based systems.

To manage schools effectively and efficiently, some problems arise related to manual systems that are still practiced today in schools of different levels in our country. (Jacksi, Ibrahim, and Ali, 2018) discuss some fundamental problems

related to the manual school system in developing countries such as document loss, stating that 7.5% of all documents are lost and 3% of the rest are filed mistakes. This proves that out of every thousand documents, twenty of them remain in the wrong place, while most of the lost documents can no longer be produced. This greatly increases the risks and costs associated with a manual school management system.

On the other hand, (Shema, 2019) says that the manual management of the school process requires a lot of human effort and waste of time, considering that the administrators have to enter the information of the students every time they want to register for the new semester making the data to be duplicated. Disadvantages of the manual school system also include difficulties in accessing real transcripts, which represent the transparent part of generating results or other information. This means that if a student's academic results are required, the opportunities to manipulate the data based on bribes are not as high as submitting them manually on paper.

Since the benefits of computer use in terms of efficiency have led to the widespread use of computer technology for operation and management activities (Shema, 2019), it seems that the creation of an automatic management system for the data needed in these schools is necessary. School Management Systems have been described in the literature as a possible lever in increasing school management performance. Demir (2006) asserts that school management boards that collect, analyze, and use information about their institution make better decisions not only for improvement but also for institutionalizing systemic improvements. These systems have changed school management in the areas of leadership, decision-making, workload, human resource management, communication, responsibility, and planning. A School Management System allows users to store almost all school information electronically, including student information, teacher materials, absences, announcements, etc. Most importantly, this information can only be shared with authorized users, the report can be easily generated and the records can be easily searched, reported, and printed.

A well-designed automated School Management System ensures that data is readily available to efficiently manage the education system and effectively meet the needs of school management, teachers, parents, and students. A well-designed system offers many other interests, such as cost minimization which is the most obvious and vital benefit of any institution. Other benefits that users will get when using the system are that it will help them carry out their daily activities in an uncomplicated and more effective manner, including easily creating profiles, computerized management of grades and evaluations, easy interaction between teachers, parents, and administrators, easy generation of time tables. Users can also get is a high level of security using the identification and authentication of users

who can access the system after being equipped with a unique profile manageable by the administrator.

To successfully develop any type of legitimate information system, there must be a sequence of processes, procedures, methods, principles, and techniques that the developer must consider (Dennis et al., 2015). This includes the step-by-step process that the developer must follow to successfully develop the system, in other words, the methodology used to control the process. (Shema, 2019) states that a good methodology should cover project management, time, project plan cost, procedures, and rules in developing any system, etc. People rely on Information Systems to communicate with each other using a variety of physical devices, information processing instructions and procedures (software), and stored data (data resources). Therefore, Boell & Cecez-Kecmanovic (2015) describe the information system as an important issue that plays a principal role in facilitating, planning, coordinating, and controlling an organization.

The main type of information systems in various organizations include transaction processing systems, decision support systems, management information systems, and executive support systems. However, to develop any type of computerized system, there is a need to do a detailed analysis of the existing information systems tactics that will be followed to implement successfully the system to be built (Ajobiewe, 2020). Management Information Systems (MIS) and Transaction Processing Systems (TPS) are mostly used in systems that include components such as inputting, storing and processing, receiving and transferring reports (Teka, 2011); moreover, all this has the nature of school management systems, therefore these two are the suggested types of IS to manage the operation of the proposed management system in Albanian public and non-public schools.

The proposed system is categorized as an MIS and a TPS at the same time, so to build a School Management System by completing all the necessary elements, it will be necessary to combine the Transaction Processing System and the Management System Information. MIS is used at the managerial level, more specifically in the case of the school, it is used by the person with the post of administrator and uses data generated by the TPS, which on the other hand includes the daily routine activities carried out at the operational level, in the case in question, the teachers and students. These transactions can be commercial transactions such as periodic billing and also include other processes such as registration, modification, storage, and retrieval of data. So, in conclusion, since both categories improve the effectiveness and productivity of the organization, the institution in our case, the most appropriate information system to use in the implementation of this system is the combination of MIS and TPS.

1.2. *Software Development Life Cycle*

Most organizations find it useful to use a standard set of steps, known as a system development methodology, to develop and support their information systems. Like many processes, information systems development often follows a life cycle, known as the Software Development Life Cycle (SDLC). Scholars and researchers describe the system development life cycle as a methodology used to develop, maintain, modify or completely replace existing information systems through the phases of planning, analysis, design, implementation, and maintenance (Gillenson et al., 2011).

To propitiously develop the school management system, it is necessary to choose the right methodology. Gillenson et al. (2011) in their study stated that the choice of the appropriate methodology determines the quality of the system, meets or exceeds the expectations of the end users, and reduces the subsequent costs to be managed and improved. However, the choice of methodology depends on the size and type of project, therefore no methodology is the absolute best; all models have their advantages and disadvantages, and the key is to be flexible and find what works for the organization and end users (Satzinger et al., 2015). In this section, the selection of the appropriate development will be carried out as well as the reasoning why, just as in the case of the selection of the information system. Let us first deal with the SDLC phases, which are presented in the diagram below:

i. *Phase 1: System planning and selection*
Planning is the basic process of understanding why an information system should be built and determining how the project will go, identifying the need for a new or improved information system if the system is successfully developed, what benefits it will bring end users, and what are the problems that the system will have solved after development (Dennis et al., 2015).

ii. *Phase 2: System analysis*
Before developing any type of software system, it must be identified what the system will do, what the system requirements are, who are the users that will be using the system, and when and where the system will be used. First, the analyst interacts with users to determine what they want from a proposed system, then the collected requirements are studied and structured according to their relationships, eliminating any repetition.

iii. *Phase 3: System design*
During systems design, analysts convert the description of the recommended

alternative solution into logical and then physical specifications of the system. In other words, the design phase decides how the system will work, in terms of hardware, software, network infrastructure, user interface, forms and reports, specific programs, databases, and files that will be needed.

iv. *Phase 4: System implementation and utilization*
The previous system specifications are turned into a functional system that is tested and then put into use, including processes such as coding, testing, and installation. The implementation phase is usually the most critical because it is the moment when design turns into coding. The processes continue with installing the system, loading the new system with data, testing the functionalities, and training the customers.

System Development Methodologies

According to (Stanisevic et al., 2011) the choice of methodology is not easy because no methodology is always the absolute best. However, based on the characteristics of each of the methodologies, an ideal one can be selected even in the case of a school management system. We can achieve a result if we make a comparison between the methodologies used in different situations based on these criteria: the user's ambiguous requirement, which emphasizes the team's ability to adapt to the situation when the user does not know how the system should be or what his system should do; the ability to adapt to a new technology that cannot be used by users; the complexity of the system; reliability; the user's estimated time for the final project; visibility from iterated parties and finally documentation along the way.

After evaluating the previous criteria throughout a development project, it seems that the throwaway prototype methodology is the most appropriate one to develop the new management system proposed in this paper. With the help of the selected methodology and the cooperation of all interested parties, the existing system will be analyzed, later to design and build the prototype of the system, which the users will evaluate and give corrective feedback, thus understanding what the system can do. According to (Sami, n.d.) throwaway prototyping methodologies are excellent choices when timelines are short, which once again emphasizes that development through "throwaway" prototypes is the most appropriate to follow in this case study.

Planning and Analysis

Methodology and research methods

In conducting any type of research, the researchers must understand the particular problem they aim to solve; this will help them understand the various important areas of research evaluated. Therefore, through this chapter, I intend to highlight the real problems of the current manual system that "Preka College" continues to use in its daily life and the expectations of end users towards the new digital system. To proceed with the phases of this cycle, it is first necessary to carry out research. This is an organized investigation that uses conventional scientific methodology to solve problems and create new knowledge that is generally appropriate, to create and achieve new conditions (Goundar, 2012).

Given the purpose of this paper and the data it needs, this research will focus entirely on qualitative research, which is described as collecting, analyzing, and interpreting data by observing what people do and say; to discover meaning, and feel and giving a broad description of the exact situation. It is necessary, to help the college under study, to know more about the problems of the current system and how it can be changed to be more user-friendly. The best way to collect the data needed would be to interview the administrator and the head of "Preka College". For years now, most of these schools have made it part of their regulations to keep up-to-date with the opinions and suggestions that come from these external factors periodically, so the school leaders are aware of the problems and needs of the students, their parents, and employees as well. This justifies the reason why part of this study will be an interview with the two persons responsible for the administrative and managerial parts of the school. Two main things are intended to be achieved through the interview: pointing out the problems that require solutions and suggestions from the interviewed staff regarding those requirements that they have and want to see implemented in the system that will be developed.

Planning

To create an information system, it is necessary to build a plan on how the development will be carried out from the beginning to the last stages. Therefore, the same will be applied in the development of the proposed management system of the College, as a sequence of procedures or methods must be carried out for the development to be completed successfully. During the planning phase, the institution or business identifies the need for a new or improved system. Oftentimes,

it happens that the customers for whom the system is made, do not have clear ideas of what problems are expected to be solved, as they initially have problems with their identification. The answers to why the system needs to be built and it will benefit the end users will only be obtained through interviewing the Administrator and Headmaster because internal employees are the only ones who can properly address problems that may seem trivial.

Initially, the first step is to formulate the questions and structure the interview so that they are simple and understandable for the interviewees, taking into account the avoidance of technical words related to the stages of system development or other technological elements, on which the administration has no reason to know, thus complicating the interview procedure. Also, these questions should give the possibility of receiving clear and complete answers, enough to enable the extraction or translation of the answers into direct and real requests. Building and conducting the interview is one part of this stage, but the most challenging part is when it comes to analyzing the answers of the two people being interviewed, with the sole purpose of listing the problems, and requirements and creating specific objectives that are expected to be met stage after stage. Not having knowledge directly related to this field, the interviewees can look for options that a system developed under these conditions would never have the opportunity to fill. Human, time, and financial resources should always be taken into account if there is a possibility that the request will have a logical and practical application.

Analysis

During this phase, it is essential to do a proper study of all the needs presented by the school, its staff, and third parties, problems, and requirements, which we can group according to users or system elements. If through the analysis of the responses from the interview it is possible to identify opportunities and areas for improvement, then a concept for the new system can be easily developed, and by understanding where these requirements come from, we can specify who are the users who will interact with the proposed system. According to the representatives of "Preka College", the problems with the manual system start from the moment the students are registered in the school, a procedure that takes time and is not efficient at all. The only person who had full rights over the system was the secretary of the institution, this means the problem with transparency was identified. Requests for data views, changes, copies, and everything else go to that employee, which also creates unpleasant and unnecessary delays, which is pointed out not only by the academic staff but also parents of students. Also, academic staff and students needed a space where they could access additional learning information and communicate more easily about academic progress, through grades or comments.

Regarding the question of how parents were informed about grades or other daily academic progress of students, the interviewees answered by saying that everything was left to the children's sincerity. The cause of other problems for managers is seen to be the authorization of a single person to throw, update, delete, and verify various data. In the case of setting a wrong grade by the subject teacher, this mistake continues to be transferred to the documents managed by the secretariat. Other changes, deletions through any method or other means, are categorically prohibited according to the explanations given by the interviewees. Analyzing the problems that the administrator and headmaster of the College presented during the interview process, serves us to present some concrete and clear requirements that this private institution wants to be met by the proposed new system.

- To increase transparency and give different individuals the opportunity to access data that is part of their responsibilities, the new system will be structured in several panels, administrator, teacher, parent, and student, each with different access rights depending on tasks and functionalities.
- Official school announcements can be made in the system and can be seen by all user panels, so each system actor will have a space dedicated to announcements in the menu.
- Each invoice can be printed, and serve as a payment mandate, a form of proof for the parties who participated in the action.
- Students' attendance is recorded according to the calendar days, avoiding the storage of countless sheets that make a daily check of students' absences. The system must enable such a storage format to return reports and data for any date that may be requested.

Establishing security in the system is a very important thing to consider, so the proposed system should have the ability to prevent unauthorized users from accessing it to maintain data confidentiality. Although Preka College has specific working hours and days, the proposed system will be accessible by administrators, teachers, parents, and students at any time, 24 hours a day, seven days a week. The system interface should be user-friendly to be easy enough to use and understand.

Design

Requirements specifications

With the explanation of the functionalities and requirements of the system in the previous chapter, now the functionalities will be described not simply listed but

specified concerning the processing mode. Below are presented in general lines some elements that are listed to be designed in the future.

1. *Login/Logout:* Enables users to log into the system using their user email and password; logout serves to exit the system.
2. *Forgot password:* If users happen to have forgotten their password, they are allowed to retrieve their password via an email message.
3. *Add/Edit/Delete:* Users such as administrators or teachers will have the opportunity to add, edit and delete data, within the level of access they have.
4. *Download/Upload document:* Students will be able to download study materials placed on the system by their teachers. Also, through this function, the student data recorded by the secretary can be easily uploaded.
5. *Send message:* Essential element for ease of communication, increased collaboration, and reduced time, available for all user dashboards.
6. *Print document:* Some documents need the option to be printed for transparency and two-sided correctness, for example, financial invoices.

Use Case Diagram

Use Case diagrams are functional diagrams that describe the basic functions of the system, showing what users can do and how the system can respond to their actions. Each graphical element in the Use Case diagram describes one and only one function through which users interact with the system, although users may take several paths to interact with it.

- *TEACHER → MANAGE MARKS*
  1. The teacher clicks Manage Marks.
  2. The system activates the grade management page.
  3. The teacher selects the given exam.
  4. Select the assigned class.
  5. Select the assigned subject.
  6. The teacher presses the Manage Marks button.
  7. The system displays grades according to verifications related to the above definitions.
  8. The teacher changes the grade and comments for the student he wants.
  9. Press the Update button.
  10. The system makes the requested change and displays it.
  11. The system displays the success message.
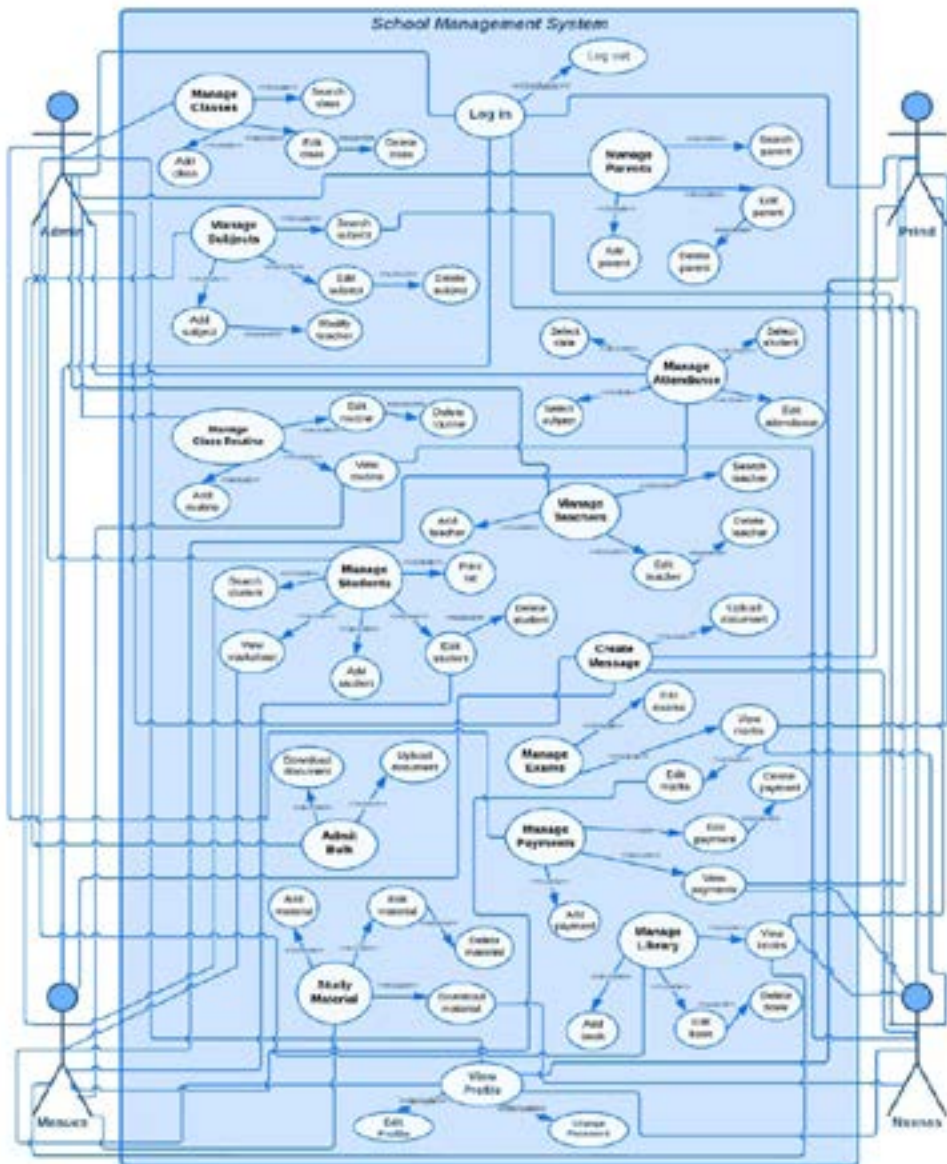
Exceptional cases

The system does not allow the selection of the subject, without first selecting the class. Then you can proceed with the display of grades.

ERD

An entity relationship diagram is a data modeling technique that creates a graphical representation of the entities and the relationships between them within an information system. To move on to the construction of this diagram, it is essential to devise the tables where the data will be stored, therefore below are listed the entities of the school system and the corresponding attributes, where primary keys are highlighted in blue, while foreign keys are highlighted in green.

1. admin – (admin_id, name, email, password, level)
2. student – (student_id, name, birthday, sex, id_no, blood_group, address, phone, email, password, father_name, mother_name, *class_id*, *section_id*, *parent_id*)
3. teacher – (teacher_id, name, birthday, sex, id_no, blood_group, address, phone, email, password)
4. parent – (parent_id, name, email, password, phone, address, profession)
5. class – (class_id, name, numeric_name, *teacher_id*)
6. section – (section_id, name, nickname, *class_id*, *teacher_id*)
7. class_routine – (class_routine_id, *class_id*, *subject_id*, time_start, time_end, day)
8. subject – (subject_id, name, *class_id*, *teacher_id*)
9. grade – (grade_id, name, grade_point, mark_from, mark_upto, comment)
10. acd_session (session_id, name, is_open, start_dt, end_dt)
11. attendance – (attendance_id, status, *student_id*, date)
12. book – (book_id, title, author, description, *class_id*, status, price)
13. ci_sessions - (id, ip_address, timestamp, date)
14. document – (document_id, title, description, file_name, file_type, *class_id*, *teacher_ id*, timestamp)
15. exam – (exam_id, name, date, comment)
16. expense_category – (category_id, name)
17. invoice – (invoice_id, *student_id*, title, description, amount, amount_paid, due, creation_timestamp, payment_timestamp, payment_method, payment_details, status)
18. mark – (mark_id, *student_id*, *subject_id*, *exam_id*, mark_obtained, mark_total, comment)
19. message – (message_id, *thread_id*, message, sender, timestamp, status)
20. message_thread – (thread_id, thread_code, sender, receiver, last_message_timestamp)
21. noticeboard – (notice_id, notice_title, notice, date, create_timestamp)

22. payment – (payment_id, *category_id*, title, payment_type, *invoice_id*, *student_id*, method, description, amount, timestamp)
23. settings – (setting_id, type, description)
24. transport – (transport_id, route_ name, no_of_vehicle, description, route_ fee)

Implementation and testing

Development Tools

Based on the literature and other studies that are not included in this paper, programming languages, libraries, different frameworks, data management systems or other elements related to the development of the system and its deployment are endless and each with specific characteristics and attributes, resulting in none being the best possible solution for every possible case. In the following parts, the tools and the reasons why they were chosen to be used in the construction of the Preka College system are specifically addressed.

The environment selected for the development of the Preka school system is Visual Studio Code because it is open source, user-friendly, and has extensions that significantly facilitate the work during coding. The main language selected for the development of the proposed system is PHP. It is known as a server-side scripting language that is used for many purposes, but that serves mostly for web developments, making them dynamic and interactive. Being a web-based system, in this paper PHP is incorporated with HTML, CSS, and JS. To make the system easy to navigate and aesthetically attractive, this paper it was chosen to use the CSS framework, Bootstrap. Having a time limit for the design and construction of the concrete system has increased the need for the use of this framework, which manages to help the development process of the front-end nature. In addition to Bootstrap, another framework that has been used in this work is the PHP framework, CodeIgniter. CodeIgniter provides "out of the box" libraries to connect to the database and perform various operations such as sending emails, uploading files, managing sessions, etc.

In addition to the tools that are needed for the development of the system, the tools that serve for the creation of the database and their management should also be mentioned. The first tool used is the Xampp platform, which helps a local host or server to test the website before releasing it to the main server. It is a platform that provides a convenient environment to test and verify the operation of projects based on Apache, Perl, MySQL Database, and PHP through the host system itself. Consequently, based on the fact that the work is done with PHP, it seems like the

best alternative. To move on to other tools, the selected web server, which is also supported by Xampp, is Apache, while MariaDB will serve as a database server or as a database management system. Based on the studied literature, MySQL turned out to be a very good and advisable system, but in the case of the proposed system, MariaDB manages to meet the expectations and requirements presented. To create, manage, and update the data, phpMyAdmin will be used, as an open-source software tool, written in PHP and intended to handle the administration of DBMS such as MySQL or MariaDB on the web.

For the development of this system, a three-tier architecture was used, the main benefit of which is the separation of logical and physical functionalities. To make it more concrete I will explain the development technologies used for each architecture level:

- Web Server Tier or otherwise presentation tier (presentation level) represents that part of the system that the user sees. This layer is built using Bootstrap and communicates with other layers through API (Application Program Interface).
- Application Server Tier is otherwise referred to as the logical tier. This level is written in the PHP programming language, which supports the main functions of the system. At this level, modifications can be made by adding or removing users without having to update the database.
- Database Server Tier or the data level is represented by MariaDB as a server and by the management system for read/write access PHPMyAdmin.

Testing of the system

After developing a system, the next thing that is done by the programmers is to verify, validate and control the application, as well as to detect defects and errors that need to be given more attention. This stage is part of the implementation stage and is called testing. Testing is performed to ensure that the system meets business requirements and technical procedures and to ensure that it functions perfectly. Testing of the Kolegji Preka management system will be carried out at this stage of development to detect unnecessary errors before it is presented as a finished system to end users. In fact, the testing phase does not start and end with control performed by the working group. The latter is based heavily on the feedback and opinions that users create during the period they use the system. This helps the team to continuously improve and update the system, always if this is part of the agreement between the developer business and the requesting client. An example would be testing whether anyone can become part of the system, or whether previously imposed restrictions work. If a user tries to enter the system without

filling in the credentials fields, after clicking the Login button, the system turns the frames of the textboxes red and displays the note "This field is required.". In case the user sets his credentials incorrectly, or his profile does not exist and presses the Login button, the system after the verifications displays the message "Invalid Login" and asks the user to enter the correct data.

Conclusion

This work was carried out to document the work and processes of building a Management System for the non-public High School, Kolegji Preka, which submitted the request for the replacement of the current manual system used by their academic staff, with an automated and easily accessible one. The work has been divided into stages according to the phases of the systems development life cycle, therefore it started with the planning of the work processes and ended with the implementation phase. Initially, a detailed study of the existing literature was carried out, comparisons were made between different information systems, to conclude that this system will serve as an MIS and TPS at the same time. In addition to this comparison, several others were made about system development methodologies, where "Throwaway Prototyping Development Methodology" was more efficient. After clarifying these details, the paper continues with the concrete and practical side of the SDLC phases.

The first action during the planning phase consisted of communication with the leaders of Preka College through a physical interview, intending to collect as much data as possible related to the progress and continuity of daily life of the current system. The interview is considered a "fact-finding" technique, which serves to clarify the situation as much as possible and to avoid later problems if the requirements and objectives are not set properly. During this phase, it was clarified that the school's resources will be used for the construction of the new system and not for the improvement of the existing one.

Conducting the interview and collecting complete data opened the way to the analysis phase, which consisted of studying the interview to list concrete, clear and realistic objectives and requirements for the system. The result included requirements related to building panels for different users, who should have different levels of accessibility; having a way of logging into the system that protects the data, but also allows different users to access the data that is part of their responsibility, such as students checking their grades after different tests; increasing transparency and speed of data collection or processing; facilitating processes related to payments or obligations that different individuals have towards the school; storing data quickly and managing it quickly and accurately. Also, the

system was required to be reliable, available, easy to use, simple to understand, and secure.

Following the development stages, during the design all the information that was collected using the aforementioned techniques was presented and organized in the form of a Use Case Diagram, Entity Relationship Diagram showing the entities and the relationships between them. All this modeling enabled a clear picture of how the proposed system would work, which managed to help Preka College leaders and staff better understand the prototype.

After the executives approved the prototype, it was time for the implementation phase to start. During this phase, after the selection of tools for development and implementation, the appearance, content, and functionalities of the system were coded. The database was created and the connections between tables and functions were built in the code, with a change from what was specified in the literature review phase (starting work with MariaDB), making each element of the system fully capable of performing the tasks to which was originally designed. The implementation phase cannot be completed without conducting tests to see the quality and functionalities of the system. This stage continues even after the system is put into operation, as opinions and feedback are expected from users regarding the progress and quality of the work processes.

Finally, with the completion of the stages of the systems development life cycle, the work has been completed. The quality of the system can be improved, always based on the documentation that is built based on the reports that are created with the help of the data from the users and based on the developments of the latest technologies that facilitate many procedures and make the system easier and more comfortable to use. At the end of this paper, it is noted that all the initial objectives presented in the introduction have been fulfilled, thus completing the biggest and most important objective which was the design and implementation of a quality system, fully functional for Preka College, according to its requirements and needs as a customer.

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