ISSN 2965-9302 | DOI: 10.5281/zenodo.10905955
Volume 1 | Número 1 | Fevereiro 2024

EASY HOURS: System for counting hours of professional contextualisation

EASY HOURS: Sistema de contagem de horas de contextualização profissional

EASY HOURS: Sistema de cómputo de horas de contextualización profesional

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Apresentado em:
05 dezembro, 2023

Evento:
6º EnGeTec

Local do evento:
Fatec Zona Leste

Publicado em:
28 fevereiro, 2024

KeyWords:
P-TECH.
Efficient.
Management.
Activities.

Palavras-chave:
Articulação Médio-Superior.
AMS.
Eficiente.
Gerenciamento.
Atividades.

Palabras clave:
Articulación Media-Superior.
MAS.
Eficiente.
Administración.
Actividades.

Citação:
Matias, A. L. F.; Rodrigues, D. C.; Mendes, G. S.; Rocha, A. M. S. e Lima, J. R. (2024). EASY HOURS: System for counting hours of professional contextualisation In: EnGeTec em Revista, n. 1, v. 1, 116-124.

Abstract:
To optimize the time of its employees and make operations more efficient, a company must always seek alternatives to improve its operations. For managing students' progress in their AMS (Articulação da Formação Profissional Média e Superior) program, it is necessary to use systems that track each student, their activities, and their logged hours in the program. Thus, it is important to create a system that facilitates hour management for the students and streamlines the coordinators' tasks when it comes to grading activities or generating reports. The system will allow students to view and submit their AMS program activities, as well as send complaints to the coordinators. Coordinators, in turn, will be able to assign tasks to students, grade them, manage the student's hours, and generate individual and collective performance reports, in addition, of course, to respond to support requested by students. IBM representative coordinators can also add new units that enter the program.

Resumo:
Para otimizar o tempo de seus funcionários e tornar as operações mais eficientes, uma empresa deve sempre buscar alternativas para melhorar suas atividades. Para gerenciar o progresso dos alunos em seu programa AMS (Articulação da Formação Profissional Média e Superior), é necessário utilizar sistemas que acompanhem cada aluno, suas atividades e suas horas de contextualização profissional registradas no programa. Portanto, é importante criar um sistema que facilite o gerenciamento de horas para os alunos e agilize as tarefas dos coordenadores em relação à avaliação de atividades ou à geração de relatórios. O sistema permitirá que os alunos visualizem e enviem suas atividades do programa AMS, além de enviar eventuais reclamações aos coordenadores. Os coordenadores, por sua vez, poderão atribuir tarefas aos alunos, avaliá-las, gerenciar as horas dos alunos e gerar relatórios de desempenho individuais e coletivos, além de, é claro, responder ao suporte solicitado pelos alunos. Além disso, os coordenadores representantes da IBM também poderão adicionar novas unidades que ingressam no programa.

Resumen:
Para optimizar el tiempo de sus empleados y hacer más eficientes las operaciones, una empresa siempre debe buscar alternativas para mejorar sus actividades. Para gestionar el progreso de los estudiantes en su programa AMS (Articulación de la Formación Profesional de Secundaria y Superior), es necesario utilizar sistemas que lleven un registro de cada estudiante, sus actividades y sus horas de contextualización profesional registradas en el programa. Por ello, es importante crear un sistema que facilite a los estudiantes la gestión de las horas y agilice las tareas de los coordinadores en cuanto a la evaluación de las actividades o la generación de informes. El sistema permitirá a los estudiantes visualizar y enviar sus actividades del programa AMS, así como presentar eventuales quejas a los coordinadores. Los coordinadores, a su vez, podrán asignar tareas a los estudiantes, evaluarlas, gestionar las horas de los estudiantes y generar informes de desempeño individuales y colectivos, además, por supuesto, de responder al apoyo solicitado por los estudiantes. Además, los coordinadores representantes de IBM también podrán agregar nuevas unidades que se unan al programa.

ISSN 2965-9302 | DOI: 10.5281/zenodo.10905955
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1. INTRODUCTION

The AMS is a program that forms partnerships between companies and schools worldwide, enabling students to access the demands of the job market and adapt quickly. At ETEC Zona Leste, the program provides activities to develop students professionally. Students take courses, and create presentations, resumes, and professional profiles. All of these activities are counted toward an annual hour goal that students must achieve.

> *As empresas estão sempre tentando melhorar a eficiência de suas operações [...]. Das ferramentas de que os administradores dispõem, as tecnologias e os sistemas de informação estão entre as mais importantes para atingir altos níveis de eficiência e produtividade nas operações [...].(Laudon e Laudon, 2014, p.11).*

How can a web system assist in the administrative management of extracurricular hours?

The project aims to create a web system that streamlines the management of each student's hours, optimizing the time for program coordinators and students, ensuring that the submission and viewing of activities are not a problem.

The project consists of a system that will allow students to view and submit activities related to AMS, as well as send complaints to the coordinators. Coordinators will be able to assign program activities to students, review their work, add hours to students, and generate performance reports for a student. To accomplish this, the following technologies will be used: HyperText Markup Language (HTML), Cascading Style Sheets (CSS), TailwindCSS, JavaScript, React, Next.js, MySQL, and Prisma ORM. During the planning and documentation phase, we also relied on Unified Modeling Language (UML) diagrams.

2. THEORICAL FOUNDATION

In this chapter, we will discuss the project's creation process. The development involves documenting the diagrams and the technologies used in the project, as well as providing illustrations of the application's screens.

2.1. Information Management System

According to Bazzotti and Garcia (2000), an information management system is a means of providing fast, accurate, and useful information, enabling structured management and improving decision-making processes for administrators.

The P-TECH program developed by the International Business Machines (IBM) requires a system to manage extracurricular hours for students due to the high demand for data from different classes and institutions. This system is needed to keep track of which activities have been assigned, when they were assigned and completed, which students are responsible for them, and the value of each activity in the program's hour planning.

To address the lack of a system that brings students and program coordinators closer together, the system to be developed combines features that enable better management for both sides. For coordinators, tools are provided to assist in managing students. On the other hand, students have a better way to organize themselves, considering the information available, such as the status of completed and pending hours for the academic year of their class.

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2.2. NextJS

As per Marchiori (2023), NextJS is a React framework that adds several features to the library, such as server-side rendering, static page generation, routing, fast refresh, and image optimization. Therefore, NextJS becomes a viable option for project development, as it operates on both the client side, using React for user interface rendering, and on the server side, enabling the creation of an API to handle client requests through NodeJS. It also allows for the use of asynchronous resources, so that some functionalities can be executed before the interface is fully rendered.

According to the Kinsta website (2023), the server-side rendering capabilities make the application suitable for Google indexing processes. Thus, NextJS is essential for an application that utilizes React and requires good performance in Google search indexing.

According to Patel (2023), the indexing process does not take JavaScript into account, as search engines have difficulties reading this technology on websites.
The following figure shows an example of an application using React only, generating all the application's content with JavaScript.

Figure 1 - Example of a React application
Source: by the author, 2023.

Since React generates all the content with JavaScript, it won't be readable by Google's indexer, and as a result, no content will be analyzed during the SEO process, which can negatively impact the application's performance in search results.

Figure 2 illustrates what the site's content would look like if JavaScript were disabled, providing an idea of how a page with pure React is analyzed by Google's indexer.

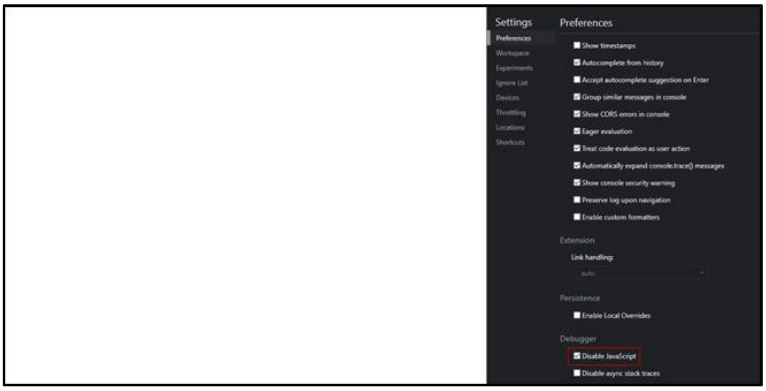

Figure 2 - how a React application would look like for an indexer.
Source: by the author, 2023.

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The image above demonstrates that using pure React for website construction can adversely affect the application's performance in the Google indexing process. As mentioned earlier, the server-side rendering capabilities of NextJS allow content to be statically rendered before the indexer reads it, ensuring that all page content is subsequently processed.

Figure 3 illustrates how content is generated by NextJS, regardless of whether JavaScript is enabled or not.

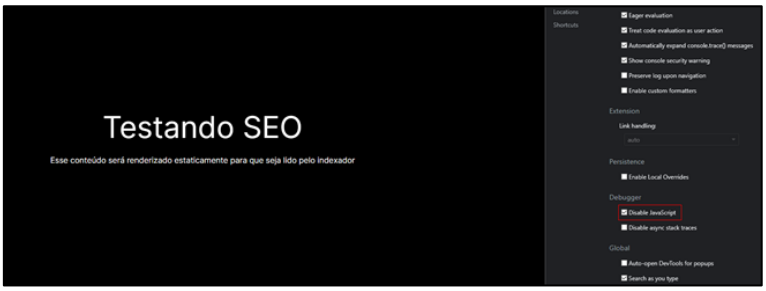

Figure 3 - NextJS application example
Source: by the author, 2023.

The image above demonstrates how the use of NextJS can enhance the performance of a web application in terms of its reach on the internet.

2.3. Prisma ORM

Prisma is an Object-Relational Mapper (ORM) designed with the goal of optimizing the connection between applications and the database. Object-Relational Mapping (ORM) is a technique that aims to bridge the gap between the object-oriented application development paradigm and the relational database paradigm. (UFSM, 2022).

Therefore, the database abstraction features provided by Prisma enable the project's database model to align with the object-oriented paradigm, making the integration of database data with the API less cumbersome. Figure 4 illustrates how a table is created in Prisma. Figure 5 shows how the table above appears after it is transformed into a JavaScript object.

```
12
13  model User {
14    id       String @id @default(uuid())
15    name     String
16    age      Int
17    email    String @unique
18    nickname String
19  }
20
```

Figure 4 - Example of a table in Prisma
Source: by the author, 2023

```
async function getUsers() {
  const users = await prisma.user.
                              aggregate   (method) Prisma.UserDelegate<De…
                              count
                              create
                              delete
                              deleteMany
                              fields
                              findFirst
                              findFirstOrThrow
                              findMany
                              findUnique
                              findUniqueOrThrow
                              groupBy
```

Figure 5 - Example of the table as an object
Source: by the author, 2023.

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The table is generated in the database and is also abstracted, becoming an object with attributes and methods. As a result, integrating the application code with the database becomes a less complex task, as database entities in the code are handled with the object-oriented paradigm.

2.4. Funcitional and Non-functional requirements

Before the creation of any diagrams, models, or designs, it was necessary to gather functional and non-functional requirements that will specify the application's functionalities and its actors.
Student Functional Requirements:

- RF01 – The system should allow the student to log in;
- RF02 – The student can submit activities in files;
- RF03 – The student can view the required hours for the academic year;
- RF04 – The system should display the hours the student has accumulated;
- RF05 – The system should show all activities the student needs to complete;
- RF06 – The student can view all completed activities.

Coordinator Program Functional Requirements:

- RF01 – The system should allow the coordinator to log in;
- RF02 – The coordinator can generate performance reports for a student;
- RF03 – The coordinator can view the required hours for each student at the end of the academic year;
- RF04 – The coordinator can view the accumulated hours for each student;
- RF05 – The system will allow the coordinator to view pending activities for each student;
- RF06 – The system will allow the coordinator to view completed activities for each student;
- RF07 – The coordinator can grade each student's activity;
- RF08 – The system should allow the coordinator to add hours to a student;
- RF09 - The system should allow the coordinator to deduct hours from a student.

2.5. ERD & ERM

ERD (Entity-Relationship Diagram) and ERM (Entity-Relationship Model) documentations are entirely focused on the project's back end. Through these, it is possible to comprehend the entire structure of the application's database.

In short, ERM is a language that allows the description of conceptual database models, while ERM is a model created using a modeling language that employs concepts from ERM (such as entity and relationship), potentially utilizing different notations.

Figure 5 shows the ERD created by the group for the development of the project. Figure 6 shows the ERM created by the group for the development of the project.

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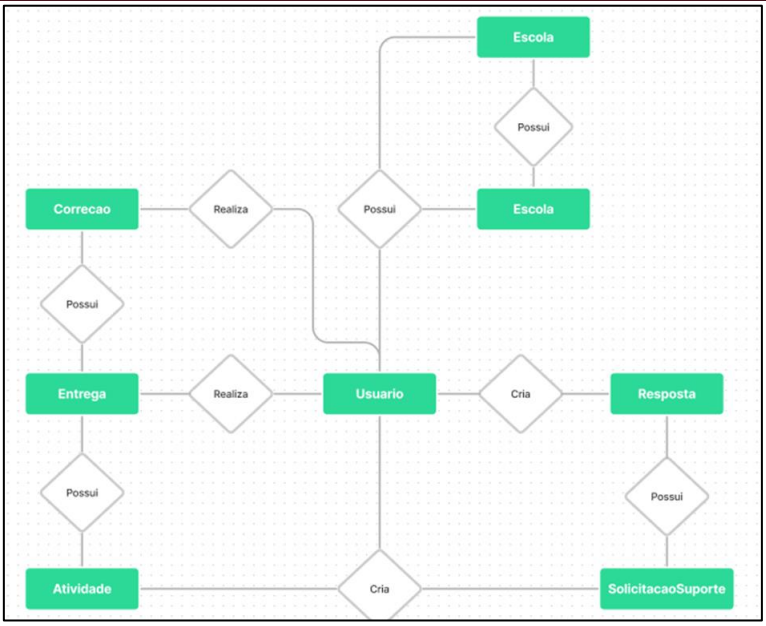

Figure 5 – ERD
Source: by the author, 2023.

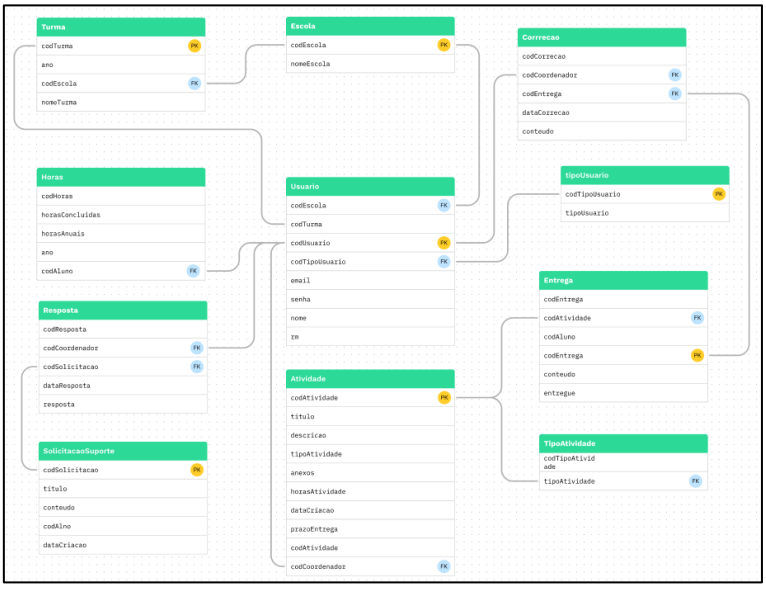

Figure 6 – ERM
Source: by the author, 2023.

2.6. USE CASE DIAGRAM

The use case diagram acts as a comprehensive document, providing users with the ability to gain insights into the operational dynamics of the project system. It offers a visual representation that clarifies how various elements within the system interact to perform specific functionalities. Each ellipse, representing a use case, encapsulates a specific functionality performed by actors within the system.

These actors can be individuals, external systems, or even scheduled processes that interact with the system. The lines connecting actors to use cases delineate specific scenarios or conditions under which these functionalities are executed, providing a detailed understanding of the system's behavior.

According to Guedes (2001), use case diagrams seek to represent the external behavior of the program and are usually constructed in the requirements analysis phase, although they are also consulted and

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possibly modified throughout the entire engineering process. This approach provides a solid foundation for the design and implementation of the system, ensuring that essential functionalities are identified and understood from the early stages of development. Additionally, the flexibility of the diagram allows for adaptations throughout the process, ensuring ongoing relevance as the project evolves. Figure 7 shows the use case created by the group for the development of the project.

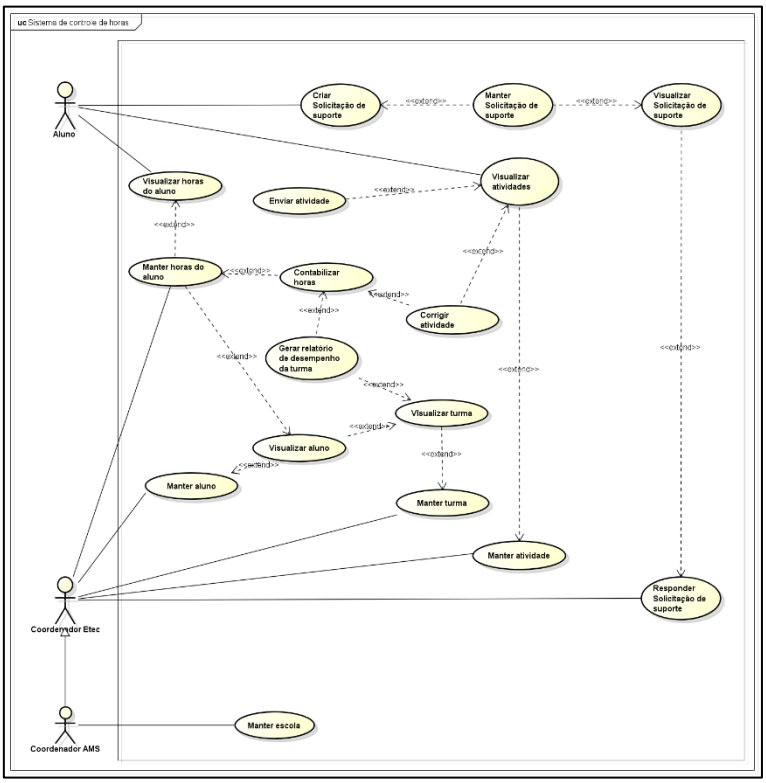

Figure 7 – Use case diagram
Source: by the author, 2023.

3. MATERIALS AND METHODS

3.1. CASE STUDY METHODOLOGY

During the research, the group employed the case study method to support the research, as it focuses on real-world concrete scenarios and current cases, which, in the case of this project, is the efficient control of AMS student hours. According to Lakatos and Marconi (2003, p. 221), the case study consists of more specific stages of investigation, with a narrower purpose in terms of providing a general explanation for less abstract phenomena.

3.2. QUALITATIVE METHODOLOGY

In a qualitative research context, it is understood as a method in which the personal experiences of system users serve as the foundation for the study. Therefore, the previous experiences of students and coordinators informed the group's research.

Research endeavors such as these contribute to the understanding of more subjective aspects, including behaviors, ideas, and perspectives, among others. Through data gathered from qualitative research, it became possible to acquire key insights for the development of a system that would effectively meet the needs of end users. Individuals such as coordinators and students participating in the P-Tech program were the primary focus of the survey. However, it is worth noting that teachers and mentors are also included, albeit in more technical aspects.

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Qualitative research plays a pivotal role in uncovering the nuanced and subjective dimensions of user experiences, shedding light on elements that quantitative approaches may overlook. The information derived from these studies serves as a foundation for building systems that not only address functional requirements but also resonate with the diverse perspectives and needs of the end users.

In this specific study, the survey targeted key stakeholders, with a primary focus on coordinators and students within the P-Tech program. Nevertheless, it is important to highlight that teachers and mentors are integral contributors, albeit in roles that involve more technical considerations. This inclusive approach ensures a comprehensive understanding of the varied user landscape and allows for the development of a system that caters to the diverse needs and preferences of all participants involved in the educational program.

4. RESULT AND DISCUSSION

Despite the conducted research and positive expectations, acknowledging the potential for limitations in the system is imperative, given that it has not been effectively applied in real-world scenarios. While the theoretical groundwork has been laid, practical testing and validations are essential to ascertain and reinforce its reliability in diverse contexts.

Furthermore, it is prudent to anticipate the need for iterations and refinements. As the system undergoes real-world testing, there may arise the necessity for the implementation of additional features or adjustments. The dynamics of user interaction and system usage in a live environment can uncover unforeseen challenges or opportunities for enhancement.

User feedback will play a crucial role in shaping the system's evolution. The potential for incorporating changes based on the insights and experiences of end-users should be embraced as an integral part of the ongoing development process. This feedback loop not only serves as a mechanism for troubleshooting but also presents the prospect of aligning the system more closely with the actual needs and preferences of its user base.

In summary, while the research conducted and initial expectations are promising, the upcoming phases of testing, validation, and user feedback are pivotal in not only confirming the system's reliability but also in shaping its ongoing development trajectory. The recognition of potential limitations underscores the commitment to continuous improvement and adaptability, ensuring the system's effectiveness in real-world applications.

5. CONCLUSION

The system developed aims to assist and automate the management of extracurricular hours for the AMS program. To achieve this goal, various research efforts were conducted regarding the possibilities for controlling hours and managing students.

The web system aims to enhance organization, thus fostering greater engagement from students. It seeks to provide transparency in the process of recording extracurricular hours, among other aspects that contribute to the program's success. Some of the expected outcomes include increased efficiency in managing extracurricular hours, a reduction in errors, and the optimization of time for coordinators and mentors, among other relevant aspects of the program.

We encourage the adoption of the proposed system for managing the AMS program. The project's implementation can bring significant benefits to the program's success and the development of the students involved. We hope that the system developed will promote and emphasize the importance of investing in technological solutions that facilitate administration.

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THANKS

In conclusion, we would like to express our heartfelt gratitude to the coordinators, mentors, and teachers who played pivotal roles in guiding and supporting us throughout our academic journey. Our appreciation extends to our classmates, whose unity and collaborative spirit enriched our learning experience.

A special note of thanks goes to IBM for their invaluable contribution and support within the framework of the AMS program. The expertise, resources, and opportunities provided by IBM have significantly enhanced the depth and scope of our research.

Furthermore, we extend our appreciation to all individuals involved in the AMS program, whose dedication and efforts have been instrumental in its success. Their commitment to fostering a conducive learning environment has been a cornerstone of our academic development.

In summary, our sincere thanks go out to everyone who has contributed to our academic endeavors, making this journey both enriching and rewarding.

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