ENGINEERING METHOD

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ALGORITHMS AND DATA STRUCTURES

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Problematic Context: Due to the lack of innovation in video game stores in the city of Cali, a millionaire businessman decided to promote an efficient way for customers to buy console games. This new store called Identity Games, aims to show a new functionality for organizing shelves with video games and some automated baskets created to help consumers find their video games

Solution development: We decided to rely on the engineering method to solve this problem. By searching various sources, it was possible to realize that 7 steps are needed to develop the solution correctly and efficiently to the problem in question.

• **Phase 1:** Identification of the Problem: Although it may not seem like it, it is the most important phase of the engineering method, a good problem must be defined to know what they are asking for and based on this, begin to develop creative, effective solutions and, above all, innovative.

• **Phase 2:** Gathering the Necessary Information: It is necessary to know the number of stores that offer the same service, the feasibility of incorporating the store into the market and the location.

• **Phase 3:** Search for Creative Solutions: Allows brainstorming

• **Phase 4:** Transition from the Formulation of Ideas to the Preliminary Designs: Collaborates in the discarding of ideas in the previous step and deepening of the most viable ones.

• **Phase 5:** Evaluation and Selection of the Best Solution: After an exhaustive analysis, the true solution is chosen.

• **Phase 6:** Preparation of reports and specifications: The most important aspects of the project are documented.

• **Phase 7:** Design Implementation: We proceed to the experimental stage to carry out the idea of the 6 previous steps.

In a deep way, we will explain each phase in a specific and detailed way.

Phase 1: Identifying the problem

On many occasions, the client is not treated in the best way when entering a physical video game store, he can lose himself looking for games in a store that is too large or also, he is not always advised by a competent person who helps him to know the availability of the products.

Based on this, the following questions can be raised: Will there be a way to minimize or eradicate this problem? Do the organizations that offer these products think of innovative ideas to offer their video games? Are customers really happy with this situation? Therefore, a way must be found to propose new paths in favor of improving service in physical video game stores.

After knowing the **needs** of the customers, it would be pertinent to have a series of **conditions** to allow greater ease and efficiency of the warehouse.

- It is intended to showcase your new way of customer service when entering the store.
- For greater efficiency when entering the place, mandatory sections were designed that will allow the consumer to be organized in their instance within the facilities.
    - The first section should allow you to choose your games
    - The second section will be in charge of choosing the best route for the client to choose the games and not wasting time returning between shelves.
    - In the third section, you should have the collection.
    - The fourth and last section will be destined to the payment of the products. - The fourth section must represent the payments.

Phase 2: Gathering the necessary information

Unfortunately, there are no physical stores that allow the customer to have a catalog of their games and collaborate in the search for them in an automated way.
There are some organizations that provide this service, but not in an innovative way, as is the case with **Security System Games**, which is a seller of this type of product, but with a very simple style like the one we will see below.

After having analyzed stores that fulfill a role similar to the one that Identity Games wants to offer, it was necessary to gather information about the applications that could be useful in carrying out this project.

GitHub: Which is a collaborative software development platform to host projects using the Git version control system. It hosts a code repository and provides you with very useful **tools** for teamwork within a project. Besides that, **you can contribute to improve the software of others.**

A very important tool to work with all the people who will support in the creation of the project. Besides that, it provides us with certain useful features, such as:

- A wiki for maintaining the different versions of the pages.
- An issue tracking system that allows your team members to detail a problem with your software or a suggestion they want to make.
- A code review tool, where you can add annotations at any point in a file and discuss certain changes made in a specific commit.
- A branch viewer where you can compare the progress made in the different branches of our repository.

Generics or generic programming, which is a type of programming that is much more focused on algorithms than on data. The idea of this way of programming is intended to generalize the functions used so that they can be used more than once. They also provide compile-time type safety that allows programmers to detect invalid types at compile-time, which will serve us in a generalized way to save time when coding the solution.

Hash tables: A hash table or hash map is a data structure that associates keys or keys with values. The main operation that it efficiently supports is the search: it allows access to the elements (telephone and address, for example) stored from a key generated using the name, account number or id. It works by transforming the key with a hash function into a hash, a number that the hash table uses to locate the desired value.

TAD: An abstract data type (hereinafter TDA) is a set of data or objects to which operations are associated. The TDA provides an interface with which it is possible to perform the allowed operations, abstracting from the way in which these operations are

implemented. This means that the same ADT can be implemented using different data structures and provide the same functionality.

Queue: It is a special linear shape, which only allows removal at the front end of the table, while the rear end of the table insert operation. In other words, it is based on a data structure that allows simulating the action of a bank "Queue". It is used to have an organization of the time of entry and exit of some data.

Stack: It is a class of LIFO type calls (Last In - First Out, or last in - first out). Like the Queue, it is a type of data structure, but it only allows access to the head of all the elements, so it can be seen as if we had a basket of things, we must remove the first object, to be able to access the rest.

Phase 3: Search for creative solutions

In this phase, what is known as "brainstorming" is very important and, as silly as it sounds, they are very useful when looking for the best solution. For that reason, we decided to brainstorm, but only one for each member of the group

Alejandro Varela: He raised the idea of a catalog that would be shown when entering the store, this would allow him to observe the number of games available with each of his units, and in addition to that, it would allow him to choose his video games before entering the store.

Gabriel Suárez: Because someone should be aware of the stocks, and the management of the store, he decided to propose a super user that would control each instance of the warehouse. He also mentioned that an application that shows the best possible route to the games chosen in the first stage of the store would be a good idea.

Luis Murcia: He proposed an application uploaded to the Play Store or Apple store, where people would download it and in it they could see everything that happened in the store. It also provided the option of an automated shopping cart to assist in the collection of the games so as not to waste time for the consumer.

Phase 4: Transition from Idea Formulation to Draft Designs

We need to find the best solution to solve the problem we are developing, for this reason it is necessary to review each of the proposals of all the members who contributed their grain of sand.

We began by reviewing each of the proposed solutions, and none was so far-fetched, but somehow it was known that it was incomplete, for that reason none was ruled out, and instead, the stage of rethinking ideas began. taking parts of each one and turning it into one that encompasses all the needs of the owner and customers.

Phase 5: Evaluation and selection of the best solution

Alejandro Varela (idea 1):

- Catalog when entering the store, allows you to see the number of games available with each of its units, also allows you to choose your video games before entering the store.

It complies with one of the requirements that were found in the identification of the problem, the selection of the games, and also proposes to be able to analyze the stocks from before, so that the client saves time.

Gabriel Suárez (idea 2):

- Creation of a super user.
- Best possible route

The idea of a super user who controls the situation of the store is an important idea that must be put in place for the benefit of the organization.

Raises the idea of an application that allows saving time in the store, meets another of the requirements in identifying the problem.

Luis Murcia (idea 3):

- Application uploaded in the Play Store or Apple store.
- Automated shopping cart.

The application in the Play Store does not sound very efficient, due to the cost and the fact that many people would not like to download applications on their cell phone, therefore, it is a completely discarded idea. The automated basket will allow working alongside the best possible route for the customer.

Reformulation of ideas (idea 4):

An application (catalog) will be created that allows users to choose their games and analyze the available units of each one, and the proposal of the best possible route to games will also be available, accompanied by an automated basket that meets this need and helps you to take your games to the cashier queue to be able to finalize your instance within the store.

To finish complying with this phase and decide the best solution, we also decided to define certain criteria that would allow us to make the best decision:

Evaluation criteria:

Criterion 1: Efficiency to enter and exit the store

- **[2]** Efficient
- **[1]** Poor
- **[0]** Does not apply

Criterion 2: Ease of use of the catalog

- **[3]** Easy
- **[2]** Normal
- **[1]** Difficult
- **[0]** Does not apply

Criterion 3: Customer convenience

- **[3]** Comfortable
- **[2]** Normal
- **[1]** Uncomfortable
- **[0]** Does not apply

Criterion 4: Ease of mobility between sections

- **[2]** Complete
- **[1]** Incomplete
- **[0]** Does not apply

	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Total
Idea 1	2	3	0	0	3
Idea 2	2	0	3	1	6
Idea 3	0	0	0	3	3
Idea 4	2	3	3	2	10

Thanks to these evaluation criteria, we agree that the best solution to be carried out is 4, and it makes sense, because it used good ideas from the previous 3.

Phase 6: Preparation of reports and specifications

You need to analyze the documents in the doc's folder. of this same project.

Phase 7: Design implementation

Our project design implementation is mounted on GitHub with a link to the repository.