

ENGINEERING METHOD

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ALGORITHMS AND DATA STRUCTURES

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Problematic Context

An eccentric foreign millionaire decided to start a very innovative business in the city of Cali in which waiting times for purchases will be reduced and there will be a greater order when making video game purchases, this through shelves and an automated system that will help the user to find and buy your products in a short time.

Solution development

To solve the previous situation, the Engineering Method was chosen to develop the solution following a systematic approach and in accordance with the problematic situation raised.

Based on a summary from Chapter 5 of the book Introduction to Engineering. Paul H. Wright defined the following steps to follow to apply the engineering method as well as a brief description of what will be done in each step of the method:

PHASE 1: IDENTIFICATION OF THE PROBLEM

The proper identification and formulation of a problem is a crucial step in solving it. Here we will proceed to identify the problem for which this person has decided to create this innovative video game business in the city of Cali

PHASE 2: COLLECTION OF THE NECESSARY INFORMATION

Once the problem is identified and needs are appropriately defined, then the information and data needed to solve it begins to be collected. We will make an elicitation of requirements as well as all the necessary applications to create a solution.

PHASE 3: SEARCH FOR CREATIVE SOLUTIONS

We will develop a brainstorming session among the members of the team selected to carry out this problem.

PHASE 4: TRANSITION FROM FORMULATION OF IDEAS TO PRELIMINARY DESIGNS

In this phase, ideas that are not feasible are discarded and promising ideas are molded and modified to form blueprints and feasible designs.

PHASE 5: EVALUATION AND SELECTION OF THE BEST SOLUTION

As the engineering design process evolves, we will evaluate a solution that best suits the problem.

PHASE 6: PREPARATION OF REPORTS AND SPECIFICATIONS

After the best design has been selected, the most important aspects of the project will be documented.

PHASE 7: DESIGN IMPLEMENTATION

Once the preliminary project, the specifications and the engineering reports have been completed, the design of the best solution will be implemented in order to generate the solution system to the problem.

Now we proceed to make a detailed description of what was done in each phase of the method

Phase 1 Identification of the problem:

Many times when a person wants to make a purchase of a video game physically, they do not know if the establishment they enter contains the video game they are looking for, so this person would be wasting time and even money if this point of sale is in distant places, in turn, when there is a lot of people in the establishment, very long waiting times are generated in the queues to check in said product. The problem, therefore, is how to reduce the time it takes for a customer to purchase a video game at a physical point.

Phase 2: Gathering the Necessary Information

In order to solve this problem we need the following information

GitHub: It is a hosting platform, owned by Microsoft, that offers developers the possibility of creating code repositories and allows them to be stored in the cloud safely. It will be the tool used to work collaboratively.

Generics: Generics are a mechanism for providing compile-time checks.

It means parameterized types. Parameterized types are important because they allow you to create classes, interfaces, and methods in which the data type on which they operate is specified as a parameter. A class, interface, or method that works with a parameter type is called a generic, like a generic class or generic method.

Hash tables: A hash table, associative array, hashing, hash map, hash table, or fragmented table is a data structure that associates keys or keys with values.

TAD: In computer science an abstract data type (ADT) or abstract data type (ADT) is a mathematical model composed of a collection of operations defined on a set of data for the model.

Queue: A Queue or Queue is a data structure that follows the FIFO Philosophy of the English First In - First Out, which in Spanish would be "First in first out". This means that the element that enters the Queue first will be the first to exit and the last to enter will be the last to exit.

ABB: Binary Search is an efficient algorithm for finding an item in an ordered list of items.

Stack: A technology stack, also called a solution stack or data ecosystem, is a list of all the technology services used to build and run a single application.

Insertion sort: It is a simple sorting algorithm, efficient only for sorting small arrays. Its processing speed is inversely proportional to the size of the array: the larger it is, the speed of the algorithm becomes slower and slower. That is why in complex systems it is preferred to use more advanced algorithms.

Selection sort: Selection Sort is a sorting algorithm that requires $O(n^2)$ operations to sort a list of n elements.

Phase 3: Search for creative solutions

For this phase, we decided to generate a brainstorming which we believe will be appropriate to provide a solution to the problem, these solutions are the following:

Idea 1:

Use the implementation of an appropriate design in a mobile application in order to facilitate access to information to the user at all times, this in turn would also give the advantage of being able to include mobile users and not only computer users as originally proposed in the problem.

Idea 2:

Create a program which allows users to enter with a code and they can know where their game will be located to choose, in addition, have restrictions based on the number of ATMs attending to control the number of people in the establishment

Idea 3:

Create a program in which the user with a code can access the establishment and the same application will tell him the most efficient route to follow to select his games. This application will show the user at any time and place the existing amount of games on each shelf of the physical establishment.

PHASE 4: transition from formulation of ideas to preliminary designs

In this phase we proceed to evaluate of the proposed solutions the one that comes closest to an adequate solution to the problem by filtering ideas.

When making this filter we realized that the ideas are not very far from an adequate solution, they all come close to a certain point although in the same way they have negative points, then we will make a detailed study of each of the solutions mentioning their negative points and positive of these.

Idea 1:

The mobile application sounds very effective in terms of user mobility, but it must be borne in mind that in our collection of information we have relied on a program with a graphical interface, that is, a program made on a computer.

Idea 2:

Idea two sounds very appropriate as a solution, it will locate the user at all times to tell him where to find his game and also controls the number of users within the establishment depending on the number of available ATMs, the negative point of this idea is that there is no note that not only the location of the games should be shown but also give the user the best route depending on their wish list

Idea 3:

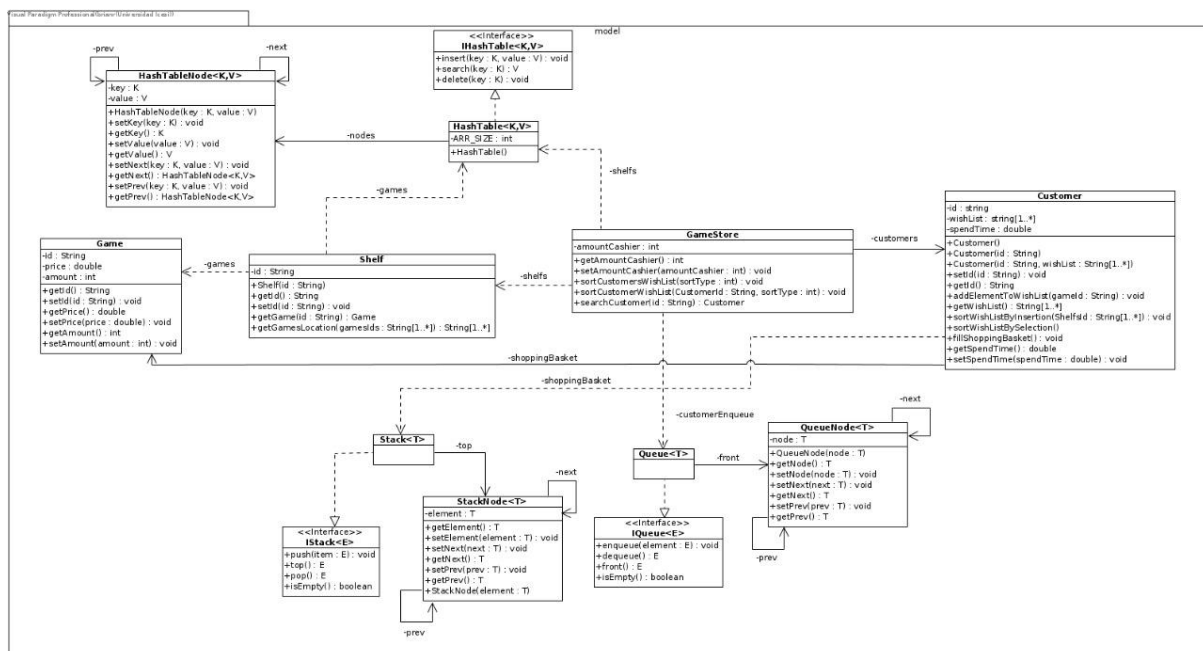
This idea complements the lack of the previous idea, although it does not appropriately include the restriction of the number of people depending on the available ATMs and thus not generate long waiting lines to invoice the chosen product.

Therefore, the ideas that are discarded are 1, idea 2 and 3 will be studied in more detail so that instead of using only one as the best solution, both will be mixed, thus generating a more complete and adequate solution and allowing us to likewise advance to the next phase.

PHASE 5: evaluation and selection of the best solution

The reformulated solution combining the best of the rain of solutions would be as follows

Create a program in which the user with a code can access the establishment and the same application will tell him the most efficient route to follow to select his games. This application will show the user at any time and place the existing number of games on each shelf of the physical establishment and finally, have restrictions based on the number of ATMs attending to control the number of people in the establishment and thus avoid being generate long queues to invoice products, in addition, a class diagram has been created to give more clarity about the solution to be implemented.



Phase 6: Preparation of reports and specifications

In this phase, the documents that will support all the documents related to the project's solution will be located in the docs folder in the github repository.

Phase 7: design implementation

The implementation of this project will be carried out in the Java programming language and its code will be in a github repository, its access will be through the following link:

<https://github.com/BrianR18/Game-Store.git>