**Engineering Method**

**Problem solving application.**

**Airline**

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**Problem Context:** The airline needs to improve the process of passenger boarding and deplaning to ensure a more efficient and comfortable travel experience for its customers. To this end, it has been requested to develop a system that allows the loading of passenger information, the identification and registration of their arrival at the boarding lounge, the establishment of an order of entry and exit of the aircraft, and the prioritization of the entry of first-class passengers. The system must be efficient, secure, scalable, flexible, reliable, and easy to use and maintain.

**Solution development:** To solve this problem, we will use a series of steps to follow, which will help us to have a systematic, effective, and efficient process to solve the need raised, which are:

**1. Identification of the needs and symptoms of the problem:** We can infer and inquire deeply into the problem that is presented to us, so we can highlight what are the aspects that are present in our case, we can lead to an effective solution:

Some of the needs and symptoms of the problem that can be identified in the statement are:

* Need to improve the efficiency of the process of getting passengers on and off the plane.
* Need to reward the punctuality of passengers entering the aircraft on a first-come, first-served basis.
* Need to prioritize the entry of first-class passengers according to certain special criteria.
* Symptom of long waiting times in the boarding lounge due to lack of order and efficiency in the process.
* Symptom of confusion and disorganization in the check-in and check-out process.
* Symptom of lack of clear information for the airline personnel in charge of operating the process.
* Symptom of lack of integration of the airline's systems and tools for information exchange.

**2. Compilation of the information:** For greater clarity in our search for a solution, we must have cleared all the elements that we are going to use, within which they can be:

* Data structures: they are ways of organizing and storing data in a computer in an efficient way so that they can be manipulated and recovered easily. Some of the data structures that can be used in this problem are arrays, linked lists, queues, stacks, trees, and graphs.
* Algorithms: are a series of instructions that are used to solve a specific problem. Some of the algorithms that can be used to solve the mentioned problem are sorting algorithms, search algorithms, tree and graph traversal algorithms, dynamic programming algorithms and recursion algorithms.
* Recursion: is a programming technique in which a function calls itself to solve a problem. It is a useful technique for solving problems that can be broken down into smaller, identical problems.
* Sorting: is the technique of arranging a set of data in a specific order. Sorting algorithms are used to arrange data so that it can be searched and retrieved efficiently.
* Searching: is the technique of finding a specific element in a data structure. Search algorithms are used to search for elements in a data structure and determine whether they are present or not.
* Trees: are data structures used to represent hierarchies of information. A tree is made up of nodes and edges that connect the nodes. Trees can be used to represent relationships between data and to organize and store information.
* Networks: are data structures that are used to represent relationships between objects. A graph consists of vertices and edges connecting the vertices. Networks can be used to represent networks, social relationships, and transportation routes, among other things.
* Dynamic programming: is a programming technique used to solve problems by optimizing a cost function. Dynamic programming is useful for problems that can be divided into smaller subproblems and can be solved optimally by combining solutions to the subproblems.

**3. Search for creative solutions:** Next, several solutions will be presented with which the problem can be developed, they were obtained through a brainstorming that resulted in the following options:

* Binary search algorithm: One way to improve the efficiency of the search for passengers in the database could be by implementing the binary search algorithm, which would reduce the search time in the case of very large databases.
* Sorting algorithm by mixture: One way to sort the passenger data by different criteria, such as accumulated miles, could be by using the sorting algorithm by mixture, which allows sorting the data efficiently and accurately.
* Tree data structure: To store passenger information, a tree data structure could be a good option, as it allows quick access to the data and efficient searching.
* Use of networks: One way to find the most efficient route for passengers to exit the aircraft in set order could be to use graphs and shortest path search algorithms, such as Dijkstra's algorithm.
* Optimized bubble sort algorithm: To sort the passenger list in order of arrival at the boarding lounge, the optimized bubble sort algorithm could be a good option, as it performs well for small lists and can be optimized to perform better on large lists.
* Use of HashMap’s: To store passenger information and perform efficient searches, a data structure such as HashMap’s could be used to map passenger data to unique keys, which would allow fast and efficient searching of the information.