IE 442

ENTERPRISE INFORMATION SYSTEMS MODELING

MRP IMPLEMENTATION PROJECT

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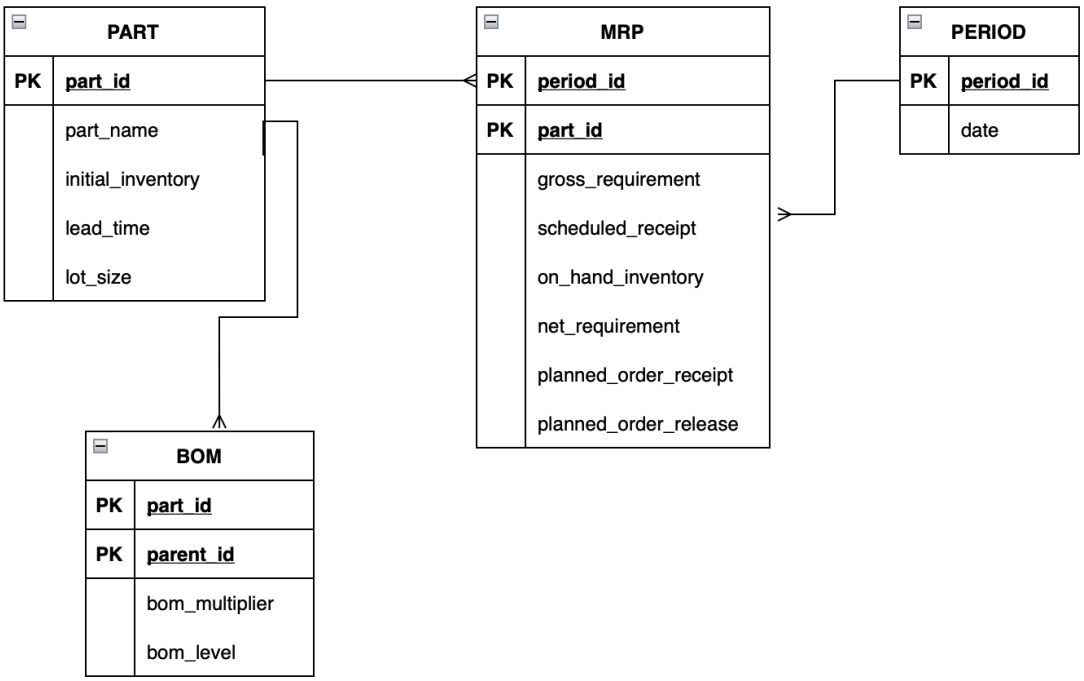
1. Introduction - Background

Material Requirements Planning (MRP) is a simple algorithm that is used to build a planning horizon for products, materials to determine the necessary quantity to order or produce to meet the customer or internal demand. In this project, the MRP algorithm is implemented through the SQL programming language via certain database schema and entity relationship diagrams. The tables are created and the attributes of the tables are filled with certain SQL operations. Then, sample data is implemented to the database to obtain calculation results. SQLite is used for databases via Python Programming Language. The code, resulting tables and the sample data can be observed in the .html file.

2. E-R Diagram



PART: Storing the parts and their attributes. The id of a part, its name, initial inventory, lead time and lot size for production purposes are stored. It has two one-to-many relationships with BOM and MRP tables because it gives the master information of the products.

MRP: Where the magic happens, it stores all the given data and the calculations made based on the given data. The primary key is part and period pair. It has a one-to-many relationship with the PART and PERIOD table. The gross requirement for the master product and the

scheduled receipt for all hierarchies are given, the rest of the entries are calculated with certain SQL queries.

BOM: It stores the hierarchy between the products. All the entries are given beforehand. The unique row of this table is found via parent_id and part_id. And the MRP calculations are done based on that relationship by multiplier usage.

PERIOD: Stores the periods and their dates. The unique row can be found via period id value. It has one to many relationships with the MRP table. Because one period id can be used for multiple products.

3. Code Explanation

After insertion of tables, the sample data is given. All attributes of PART, PERIOD and BOM tables are given, because the knowledge of such information is something that is already known within the manufacturing systems. For the MRP table, gross_requirement and scheduled_receipt information is given as external data, the rest of the attributes are decisions or calculations. After the sample data is given the initiation of the MRP table is as follows.

1. Taking the initial inventory data of the master product from the PART table and implementing it to the first period value of the MRP table. Then, calculating the attributes based on the requirement, on hand inventory and scheduled receipt data.

2. After determination of planned_order_release of the master product, the gross requirement of the component products are also determined since they are assumed to not have an independent demand for the given sample initiation. After their initiation, their decision based calculations are also completed.

Upon completion of the values of the master product, the components are also completed and the MRP calculations are done.

4. Further Improvements

In this project, the MRP algorithm has been simply implemented in the software and can be used for a good basis of starts and for the ease of calculations, certain assumptions of sample data and the planning conventions are implied. In the case that these assumptions have been relaxed, the project can be developed for further implementations.

1. **Backlog Handling:** In the case of backlog, the algorithm that is proposed on this project can provide restricted values on the MRP table i.e. negative inventory values. So, the sample data is given for no backlog cases.
2. **Complex Product Structure:** In this project, the sample data is given as one master product that has two subcomponents and these subcomponents do not have separate independent demand. For further improvements, more sophisticated multiple master products with lots of subcomponents that can be further be a joint tree.
3. **Capacity Implementation:** For more accurate real-life analysis, the capacity constraint can be implemented so that the planning will be bounded inside the feasible pairs of production.