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## DEVELOPMENT OF DATABASE MANAGEMENT SYSTEM FOR SMALL SCALE MANUFACTURING INDUSTRY

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### Abstract

The data storage and backup are critical and essential in small-scale manufacturing companies. The several kinds of data are generated in each department, hence it is necessary to data centralization. In most of the cases, this data is manually maintained by the user in terms of the data register. So, data management is a difficult and time-consuming process. To overcome this problem, it is necessary to develop a system which maintains all this data in a database file. This file helps to improve the work transparency and data is also centralized in a single location. For this purpose, Database Management System (DBMS) application is developed. DBMS is constructed on the Visual studio platform (IDE) using C# as a programming language. For data management, we have used a Microsoft SQL server. DBMS has an easy user interface, powerful data management and data retrieval system.

**KEYWORDS:** Database Management, SQL server, Visual studio, C#.

### 1. INTRODUCTION

In the small company's records are maintained by the traditional way like on paper or registers. It is a difficult and time-consuming process to manage and track all records. If companies rely on the paperwork it will be difficult to share or convey information on distance. This DBMS application was designed for automating the existing manual system. This application eliminates paperwork which could lead to loss of data. It displays information as per individual duties and also allows authorized user to create or update information. For this purpose, every user has their own password hence data are also protected from external. All information is thoroughly validated and review by the administration. MS SQL server is used to store data securely also decreases the work hours. DBMS provides a user-friendly interface for maintaining various product data. It can be used by any small-scale companies to maintain their product record. This paper includes the development phase of the DBMS application.



Fig. 1. Traditional way vs. DBMS

### 2. LITERATURE REVIEW

**2.1 Similar Research:** In this section, we have discussed the research carried out in the data management system in different field like inventory management, institution-level etc.

QIU Xiaoping [9] illustrates the development of the inventory management system based on the workflow era. For this purpose, the data structure is used to collect various information and store into a tabular format. Finally, this information has divided into various manners to expand a system

In this paper author Min Rao [8] focus upon the system which keeps away from the negligence of the employees. This system is primarily based upon SQL server database using C# language. The system divides into sub-module for improving overall performance and decreasing operation price.

In most of the institution, information is manually accumulated and recorded in paper format. So, there's a risk of loss or corruption of the information. To keep away from this case the author ElviFetrina [1] has developed a database control system using object-oriented approach. Finally, the using system, it is possible to manage the inventory process which includes the tracking, keeping and reporting.

**2.2 Conclusions derived from literature review:** Scanning to various literature and research paper is found that Serval research has done on database management in the area of inventory management and institutional level. This concept is also applicable to small-scale manufacturing industries where data is flowing between quality and production department. To manage this data, we have developed a DBMS

### 2.3 The Objective of the system

- The data will be stored automatically in a database file instead of paperwork.
- The data updating facility, which should also improve work transparency.
- The data centralization.
- To separate login, get entry to for each member
- The user-friendly system.

### 3. SOFTWARE DEVELOPMENT MODEL

The DBMS is a Windows-based application. The development of this application is based on the selection of the software development life cycle (SDLC). Fig. 2 shows the implementation difference between Agile model and waterfall model. The Waterfall model is implemented as a single object, but the Agile process model is divided into a number of objects. So, the Agile model is more flexible as compared to the waterfall

model. The agile model focuses on client requirement and involves them in each phase. For this project, we had used an Agile methodology. It involves the combination of iterative and incremental process, for this purpose project is divided into smaller segment this iterative methodology supports a product slightly than project mindset. This model improves continuously technical superiority and good to enrich the design.

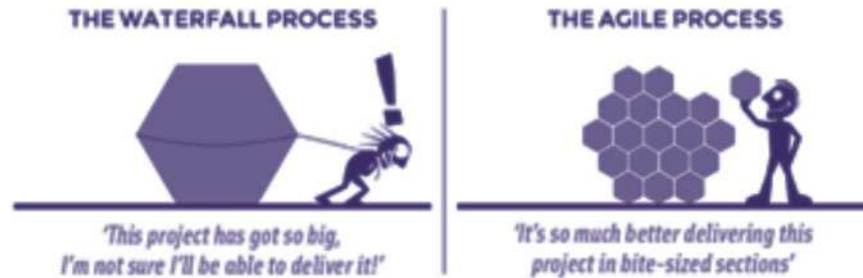


Fig.2. Agile vs. Waterfall model [8]

### 4. PHASE IN DBMS DEVELOPMENT

For each software development has its own lifecycle phase. There are four phases available in DBMS lifecycle are as follows:

#### 4.1. Requirement Phase

This phase involves the collection of information which is necessary for various module creations. The requirement is categories are as follows:

##### 4.1.1. Functional Requirement

- Invoice Creation.
- Stock Register Management.
- Product Dispatch Management.
- Product Quality Management.
- Correction Action Report Analysis.
- Debit Note Creation.

##### 4.1.2. Non-functional requirement

- Security.
- User friendly.
- Performance.

##### 4.1.3. Module wise requirement

- Store Department:
  - a. To store all product data.
  - b. To track all data whenever necessary.
  - c. To check availability of material in store department.
  - d. To easily access all data and update are requirement.
- Quality Department Requirement
  - a. To evaluate and update quantity of product.
  - b. To track the record of various corrective action reports.
  - c. To create debit note.

##### 4.1.4. System Requirement

- Microsoft Visual Studio (Using C# as language)

- Microsoft SQL Server Management Studio

#### 4.2. Design Phase

This phase includes the data flow diagram, flowchart, detailed flow graph site trees, and the design process on the front end (Visual studio) and back end (SQL database) of the Database management system.

##### 4.2.1. Data Flow Diagram

It is the graphical representation of the data flow of DBMS. This diagram is useful in understanding the data processing. The Data flow diagram is used to specify the interrelations between various modules. Movement of data transformation or processing in DBMS is shown in fig. 3.

##### 4.2.2. Detailed Flow Chart

Fig. 4 shows a graphical representation of a detailed flowchart for various exiting modules in DBMS. In DBMS for each user, we will provide a unique username and password so it will maintain security. The application starts from the login window after a successful login user can perform their activity as per their role in the system.

**Store:** The initial data are created from this module. The role of the store module is to collect, accumulate and disburse the material as per need in organizing. For this purpose, this module is divided into three-win form are as follows.

- Invoice: Invoice creation is the process of systematically defining and describing all items of materials in stock. In this process for each item denotes a specific code or vocabulary as per company standard.
- Stock Register: Maintain the stock record is one of the basic functions of this module. Using this function, we can easily find out the availability of various materials
- Dispatch: It includes various detail like purchase order number, Product name, number, quantity, and weight of product etc.

**Quality:** The quality module is used to update the status of each part on DBMS, like accept or reject parts based on the inspection report. It will also generate debit note for each

rejection this module also deals with various correction action reports in which data are stored according to team leader and their task.

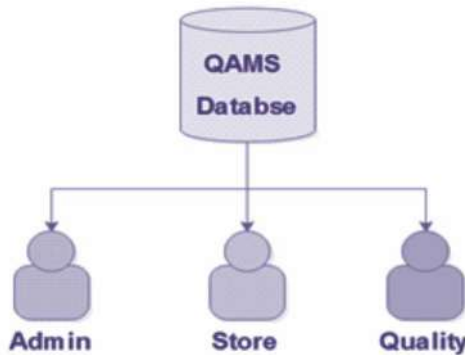


Fig. 3.Data Flow diagram

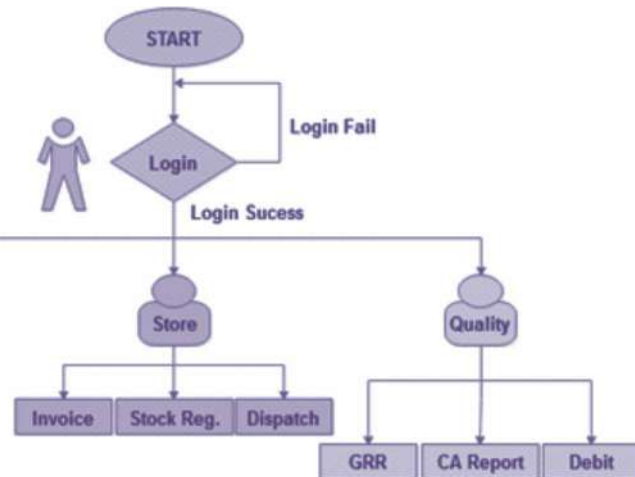


Fig. 4.Flow Chart

#### 4.2.3. Database Design

A database management system (DBMS) is used to collect and retrieve the data. Figure 6 shows a database relation in SQL server. In SQL the data is stored in terms of a column. For the DBMS database, we had created tables where each table deals

with a particular set of information. The information is contained in each column where each column contains a field name. Fig. 5 show GRR table with respected output store in the database.

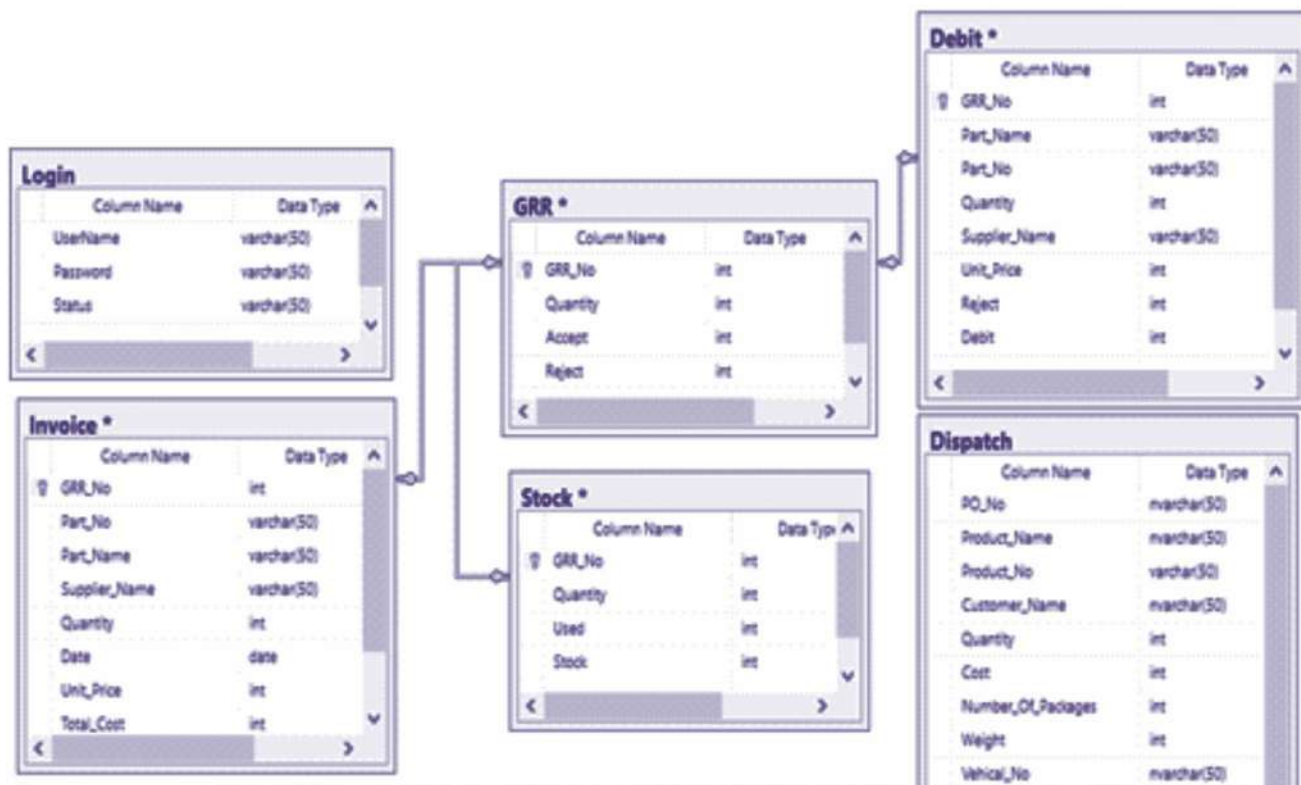


Fig.5. SQL Relationship



### 4.3. Implementation Phase

In this phase, we can create logic using C# language. For this purpose, we have a deal with the SQL API. Following API is mostly used in this project are as follows:

#### 4.3.1. SQL Connection Object

This object is used for integration between DBMS to the database. This is a core object which is necessary for communicating of other objects like SqlCommand and SqlDataAdapter. Fig. 6 shows code Snippets for Integration in DBMS.

```
SqlConnection con = new SqlConnection(
    @"Data Source=DESKTOP-P2TEVU4;
    Initial Catalog=newQAMS;
    Integrated Security=True"
);
```

Fig.6.SQL integration code snippet

#### 4.3.2. SQL Command Object

This object is useful in data interaction with the database. For example, we can add, modify and delete from the database table using the command object. The fig.7 shows code snippets for Add a button using a command object.

The SQL Command object consists of the following method:

- Data Insert: Used Execute Non-Query method. This method is also used in data updating and removing from the database.
- Data retrieving: Used Execute Reader method.

```
con.Open();
SqlCommand cmd = con.CreateCommand(); // Pass the connection to a command object
cmd.CommandType = CommandType.Text;
cmd.CommandText = "insert into Invoice values(" + GRRIotx.Text + "," + PartNoTx.Text + "," + "" +
cmd.ExecuteNonQuery(); // method used to execute the sql statements
con.Close();
disp_data();
clear_disp();
```

Fig.7. Command object code snippet

#### 4.3.3. SQLReader Object

This object is useful in reading data from the database. This type of feature required in a search operation. For using this object first data is retrieved in the data table object, then databale is connected to grid view. The fig.8 shows the code snippet for data retrieving.

```
DataTable dt = new DataTable();
SqlDataAdapter da = new SqlDataAdapter(cmd);
da.Fill(dt);
dataGridView1.DataSource = dt;
con.Close();
```

Fig.8. Data reader object code snippet

### 4.4. Testing Phase

Any software development life cycle testing phase is essential. This phase is useful to find out bugs in software and make the software bug free. Testing is useful to improve the excellence, consistency, and performance of the system. The software application is not always 100% bug -free, but we can make to use friendly as possible as using this testing. Testing is carried in iteration wise as per AGILE model so it will reduce the chances of project failure.

## 5. RESULT

### 5.1 Login Form

The DBMS start with a login page. The user can enter a user name and password to access a particular module. This type of functionality increases the data protection level. Fig.9 shows login forms are as follows.

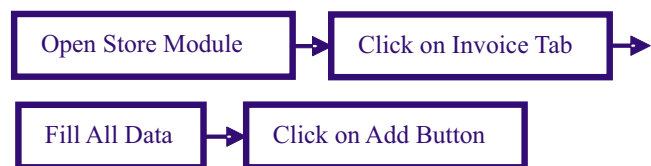
Fig.9. Login form

### 5.2 Store Module:

The store module gives access to data regarding the storage part and packing product. Fig. 10 shows the quality module. This page display after the store logs into DBMS application.

Fig. 10. Store MDR form

- Invoice creation: Using this form we can store the record of new component which is entered in the company. Fig. 11 shows the invoice form used in DBMS application.



GRR No	Part No	Part Name	Supplier Name	Quantity	Date	Unit Price	Total Cost
21	04.303.45	Window Plate	UGC	50	5/3-2018	100	5000
21	PS.012.406	LO Pump	Lakshmi Ind.	300	5/3-2018	500	150000

Fig. 11. Invoice creation form

- **Stock Checking:** By using this form store keeper check the available quantity of product from any location and take an immediate action on them. Fig. 12 shows stock register form in which user enter GRR no and click on get button. The DataGrid view shows the quantity with respect column.

Path:

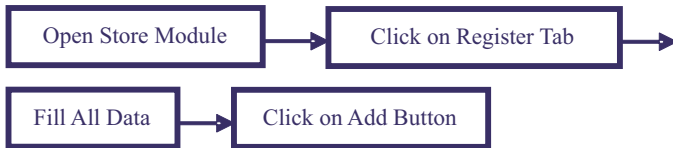


Fig. 12. Stock register form

- **Product Dispatch:** At the time of material dispatch this form (Fig. 13) is filled by store section. Using this form user can track the detail of product transportation.

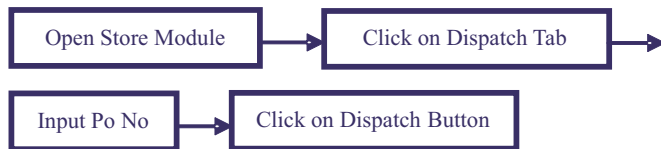


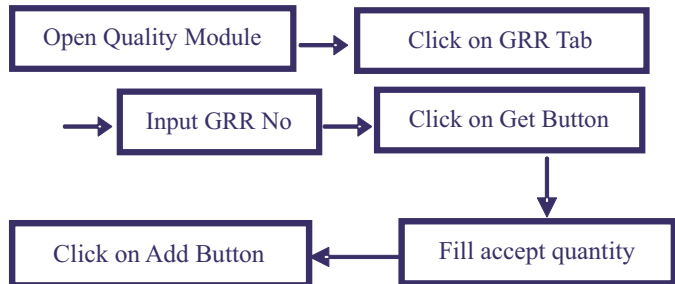
Fig. 13. Dispatch form

### 5.3 Quality Module

The Quality module gives access to data regarding inspection status, debit note creation, and CAR formation. Fig. 14 shows the quality module. This page display after the Quality logs into DBMS application

Fig. 14. Quality menu form

- **GRR decision:** This user form (Fig. 15) is useful for quality inspector.



The quality department has filled this form on basis of the inspection report and according to status of material store will take necessary action on them.

Path:

Fig. 15. GRR form

- **Corrective Action Report:** Every group leader works on different projects. So, it is necessary to store the status of each project. For this purpose, CAR report form (Fig. 16) is useful.

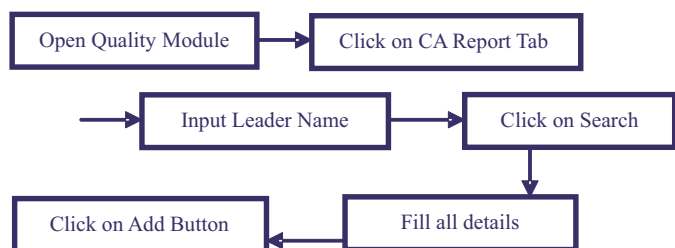


Fig. 16. CA report form

- Debit Note: For every component rejection supplier will pay some amount is known as debit amount. Fig. 17 shows the debit form which is stored all records of rejection and according to that debit amount shows.

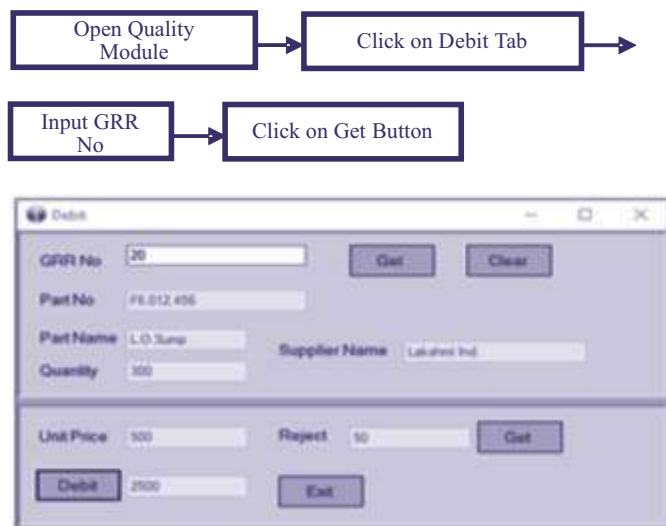


Fig. 17. Debit form

#### 5.4 Admin Module

The Admin module gives the highest level of power in the DBMS application. Admin login is accessing the entire module present them in the system. Administrator edits and checks all the updates. The figure shows the Admin module. This page display after the Admin logs into DBMS application.



Fig. 18. Admin menu form

#### 6. CONCLUSION

In this paper, we propose a data management system to enhance the information storage control. This application disposes of manual paperwork and stores the all information in local MS SQL database server. MS SQL server can remotely manage by company management to track the inventory information and it facilitates to take a brief decision. This system describes the data flow relationship between the storage and quality department. The System user interface is very easy to understand, powerful information control, statistics retrieval, and information manipulation system. Using this system, we can easily access, manage and update data effectively. This system can be used by a new user without much more knowledge about the database system. This application could be very useful in small scale companies for saving precious time and reduces the paperwork.

#### Nomenclature

DFD	Data Flow Diagram
DBMS	Database Management System
GRR	Goods Received Receipt
SDLC	Software Development Life Cycle
SQL	Structured Query Language
UI	User Interface

#### REFERENCES

- [1] Fetrina, Elvi. "Inventory management information system development at BPRTIK KEMKOMINFO Jakarta." *2017 5th International Conference on Cyber and IT Service Management (CITSM)*. Denpasar, Indonesia: IEEE, 2017. 1-4.
- [2] Huang, Weijian. "Management information system applied in the logistics." *2010 International Conference on Intelligent Computation Technology and Automation*. Changsha, China: IEEE, 2010. 626-628.
- [3] Jain, Samkeet. "Smart university-student information management system." *017 International Conference On Smart Technologies For Smart Nation (SmartTechCon)*. Bangalore, India: IEEE, 2017. 1183-1188.
- [4] Joshi, Lalit Mohan. "A Research Paper on College Management System." *International Journal of Computer Applications* 122.11. 2015. 32-44.
- [5] Kukhnavets, Pavel. *blog.ganttpro.com*. 24 November 2016. Blog. <[www.blog.ganttpro.com/en/waterfall-vs-agile-with-advantages-and-disadvantages/](http://www.blog.ganttpro.com/en/waterfall-vs-agile-with-advantages-and-disadvantages/)>.
- [6] Li, Fei. "Study on Management Information System Design for Counselor." *2017 International Conference on Smart Grid and Electrical Automation (ICSGEA)*. Changsha, China: IEEE, 2017. 688-691.
- [7] Pardede, Eric. "New SQL standard for object-relational database applications." *ESSDERC 2003. Proceedings of the 33rd European Solid-State Device Research - ESSDERC '03 (IEEE Cat. No. 03EX704)*. Delft, The Netherlands: IEEE, 2003. 191-203.
- [8] Rao, Min. "Cold storage management information system out of storage modules introduction." *2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)*. Dengleng, China: IEEE, 2011. 243-245.
- [9] Xiaoping, QIU. "The development of inventory management information system based on workflow technology." *2009 Second International Symposium on Electronic Commerce and Security*. Nanchang, China: IEEE, 2009. 161-165.
- [10] Zhang, Wenyu. "Research on the design of international student management system." *2017 6th International Conference on Computer Science and Network Technology (ICCSNT)*. Dalian, China: IEEE, 2018. 148-152.

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