CHAPTER 5: DATA MODELING OF PMS

5.1 DATA MODELING CONCEPT

If software requirements include the necessity to create, extend or interact with a database or complex data structures need to be constructed and manipulated, then the software team chooses to create data models as part of overall requirements modeling. The entity-relationship diagram (ERD) defines all data objects that are processed within the system, the relationships between the data objects and the information about how the data objects are entered, stored, transformed and produced within the system.

5.2 DATA OBJECTS

A data object is a representation of composite information that must be understood by the software. Here, composite information means an information that has a number of different properties or attributes. A data object can be an external entity, a thing, an occurrence, a role, an organizational unit, a place or a structure. 5.2.1 Noun identification We identified all the nouns whether they are in problem space or in solution space from our usage scenario.

|  |  |  |  |
| --- | --- | --- | --- |
| Serial number | noun | problem/solution space | Attributes |
| 1 | user | s | 11, 12, 13, 14, 15, 23 |
| 2 | Software | p |  |
| 3 | signup/registration | s |  |
| 4 | sign in | s |  |
| 5 | account recovery | s |  |
| 6 | system | s |  |
| 7 | authentication | s |  |
| 8 | owner | s |  |
| 9 | administrator | s | 11, 12, 13, 14, 15, 16 |
| 10 | information | p |  |
| 11 | Full name | s |  |
| 12 | username | s |  |
| 13 | email | s |  |
| 14 | present address | s |  |
| 15 | password | s |  |
| 16 | backup-question and answer | s |  |
| 17 | authority | p |  |
| 18 | salesperson | s | 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31 |
| 19 | shareholder | s | 32, 33, 34, 35, 36, 37, 38, 39, 40 |
| 20 | data | p |  |
| 21 | Full name | s |  |
| 22 | username | s |  |
| 23 | contact number | s |  |
| 24 | email | s |  |
| 25 | present address | s |  |
| 26 | permanent address | s |  |
| 27 | password | s |  |
| 28 | date of recruitment | s |  |
| 29 | salary | s |  |
| 30 | national id | s |  |
| 31 | date of birth | s |  |
| 32 | Full name | s |  |
| 33 | username | s |  |
| 34 | password | s |  |
| 35 | contact number | s |  |
| 36 | email | s |  |
| 37 | present address | s |  |
| 38 | permanent address | s |  |
| 39 | national id | s |  |
| 40 | investment | s |  |
| 41 | validity check | s |  |
| 42 | characters | s |  |
| 43 | number | s |  |
| 44 | format | p |  |
| 45 | confirmation code | s |  |
| 46 | digits | s |  |
| 47 | correct entry | p |  |
| 48 | account creation | s |  |
| 49 | individual | p |  |
| 50 | Database | s |  |
| 51 | log in | s |  |
| 52 | first login time | s |  |
| 53 | daily basis | p |  |
| 54 | five times | s |  |
| 55 | three hours | s |  |
| 56 | sign out | s |  |
| 57 | unsaved data | s |  |
| 58 | log out time | s |  |
| 59 | stock | s |  |
| 60 | pharmacy | p |  |
| 61 | drugs | s |  |
| 62 | first aid products | s |  |
| 63 | hygiene products | s |  |
| 64 | medical tools | s |  |
| 65 | attributes | p |  |
| 66 | products | s | 67, 68, 69, 70, 71, 72, 73, 74, 75, 76 |
| 67 | product name | s |  |
| 68 | product id/PID | s |  |
| 69 | product type/P-type | s |  |
| 70 | component | s |  |
| 71 | company name | s |  |
| 72 | cost price | s |  |
| 73 | manufactured date | s |  |
| 74 | expiry date | s |  |
| 75 | discount | s |  |
| 76 | sale frequency | s |  |
| 77 | carton | p |  |
| 78 | stock reserve | s |  |
| 79 | supplier | s | 135, 136, 137, 138, 139, 140, 141, 142 |
| 80 | Sale | s |  |
| 81 | update | s |  |
| 82 | pop-up | p |  |
| 83 | accidents | p |  |
| 84 | political conflicts | p |  |
| 85 | extortion | p |  |
| 86 | theft | p |  |
| 87 | natural disaster | p |  |
| 88 | drop | p |  |
| 89 | demands | p |  |
| 90 | expired products | s |  |
| 91 | business | p |  |
| 92 | investment | s |  |
| 93 | daily transaction | s |  |
| 94 | transaction information | s | 95, 96, 97, 98, 99, 100 |
| 95 | transaction id/TID | s |  |
| 96 | product name | s |  |
| 97 | product id/PID | s |  |
| 98 | quantity | s |  |
| 99 | Date | s |  |
| 100 | username | s |  |
| 101 | maintenance expenditures | s | 104, 105, 106, 107, 108, 109 |
| 102 | shop rent | s |  |
| 103 | electric bill | s |  |
| 104 | expenditure transaction id/ETID | s |  |
| 105 | expenditure transaction type/ET-type | s |  |
| 106 | expenditure transaction amount | s |  |
| 107 | username(salesperson when paying him/her) | s |  |
| 108 | Date | s |  |
| 109 | remarks | s |  |
| 110 | profits | s |  |
| 111 | cash withdrawal | s |  |
| 112 | Loss | s |  |
| 113 | notification | s |  |
| 114 | record | s |  |
| 115 | date of incident | s |  |
| 116 | customer | s | 125, 126, 127, 128, 149, 150, 151 |
| 117 | deal/contract | p |  |
| 118 | Information Management System | s |  |
| 119 | Purchase | s |  |
| 120 | Certain number | s |  |
| 121 | System/interface | s |  |
| 122 | Low stock alert | s |  |
| 123 | Request | s |  |
| 124 | Full Payment | p |  |
| 125 | Customer name | s |  |
| 126 | Contact no | s |  |
| 127 | national id/NID | s |  |
| 128 | customer address | s |  |
| 129 | pending due | s |  |
| 130 | permission | p |  |
| 131 | messages | s |  |
| 132 | daily transaction history | s |  |
| 133 | monthly profit/loss graph | s |  |
| 134 | monthly transaction graph | s |  |
| 135 | supplier name | s |  |
| 136 | supplier address | s |  |
| 137 | supplier contact no | s |  |
| 138 | joining date | s |  |
| 139 | company name | s |  |
| 140 | company email | s |  |
| 141 | company contact number | s |  |
| 142 | company address | s |  |
| 143 | company | s | 139, 140, 141, 142 |
| 144 | cash details | s | 145, 146, 147, 148 |
| 145 | debtor's amount | s |  |
| 146 | creditor's amount | s |  |
| 147 | assets | s |  |
| 148 | profit | s |  |
| 149 | due amount | s |  |
| 150 | date of due occurrence | s |  |
| 151 | due product name | s |  |

5.2.2 Potential Data Objects

User: 11-15, 23

Administrator: 11-16

Salesperson: 21-31

Shareholder: 32-40

Supplier: 135-142

Customer: 125-128, 149-151

Products: 67-76

Maintenance expenditures: 104-109

Transaction Information: 95-100

Company: 139-142

Cash details: 145-148

5.2.3 Analysis for finalizing Data Objects:

Administrator, Salesperson, Shareholders are all users of PMS and thus have common attributes stored as data object **User.**

Recruitment date and salary is kept stored in **Salesperson.**

Investment is stored in **Shareholder**.

**Company** stores company information such as name, email, address, contact number.

**Company** has **Products** and **Suppliers.**

**Products** holds all the product information including expiry dates and discounts.

**Transaction information** contains transaction details including product name, date and username of salesperson conducting the transaction.

**Maintenance expenditures** consists of maintenance expenditure information and also includes username of recipient of cash when salesperson’s salary is being paid.

**Customer** holds the information of customers who have taken a product with payment pending.

**Cash details** keep record of assets, debtor’s amount, creditor’s amount and profit.

5.2.4 Final Data Objects

Table 2 : Final Data Objects

|  |  |
| --- | --- |
| 1 | User: User ID, Full name, Password, Email, Present address, Contact number |
| 2 | Administrator: Backup question, Answer |
| 3 | Salesperson: National ID (NID), Date of recruitment, Permanent address, Salary |
| 4 | Shareholder: National ID (NID), Permanent address, Investment |
| 5 | Product: Product name, Product id (PID), Product type (P-type), Component, Company name, Cost price, Manufactured date, Expiry date, Discount, Sales frequency |
| 6 | Supplier: Supplier name, Supplier address, Supplier contact number, Joining date, Company name |
| 7 | Company: Company name, Company address, Company contact number, Company address |
| 8 | Transaction Information: Transaction ID (TID), Product name, Product id (PID), quantity, date, username( of salesperson) |
| 9 | Maintenance expenditures: Expenditure Transaction ID (ETID), Expenditure Transaction Type (ET-type), Expenditure Transaction amount (ET-amount), Username(recipient of money) |
| 10 | Customer: Customer name, Customer contact number, Customer address, National ID (NID), pending due |
| 11 | Cash details: Assets, Debtor’s amount, Creditor’s amount, profit |

5.3 DATA OBJECT RELATIONS

Data objects are connected to one another in different ways.

Is a

|  |  |
| --- | --- |
| Administrator | User |

Is a

|  |  |
| --- | --- |
| Salesperson | User |

Is a

|  |  |
| --- | --- |
| Shareholder | User |

pays

|  |  |
| --- | --- |
| Administrator | Salesperson |

adds

|  |  |
| --- | --- |
| Administrator | Salesperson |

removes

|  |  |
| --- | --- |
| Administrator | Salesperson |

edits information

|  |  |
| --- | --- |
| Administrator | Salesperson |

grants permission

|  |  |
| --- | --- |
| Administrator | Shareholder |

adds

|  |  |
| --- | --- |
| Administrator | Shareholder |

removes

|  |  |
| --- | --- |
| Administrator | Shareholder |

Edits information

|  |  |
| --- | --- |
| Administrator | Shareholder |

adds

|  |  |
| --- | --- |
| Administrator | Supplier |

removes

|  |  |
| --- | --- |
| Administrator | Supplier |

Edits information

|  |  |
| --- | --- |
| Administrator | Supplier |

manages

|  |  |
| --- | --- |
| Administrator | Product |

views

|  |  |
| --- | --- |
| Administrator | Transaction Information |

manages

|  |  |
| --- | --- |
| Administrator | Maintenance Expenditure |

views

|  |  |
| --- | --- |
| Administrator | Customer |

invests

|  |  |
| --- | --- |
| Administrator | Cash |

withdraws

|  |  |
| --- | --- |
| Administrator | Cash |

views

|  |  |
| --- | --- |
| Administrator | Cash |

notifies

|  |  |
| --- | --- |
| Salesperson | Administrator |

Sends request

|  |  |
| --- | --- |
| Salesperson | Suppliers |

manages

|  |  |
| --- | --- |
| Salesperson | Products |

creates

|  |  |
| --- | --- |
| Salesperson | Transaction Information |

views

|  |  |
| --- | --- |
| Salesperson | Transaction Information |

manages

|  |  |
| --- | --- |
| Salesperson | Customers |

adds

|  |  |
| --- | --- |
| Salesperson | Cash |

invests

|  |  |
| --- | --- |
| Shareholder | Cash |

views

|  |  |
| --- | --- |
| Shareholder | Cash |

withdraws

|  |  |
| --- | --- |
| Shareholder | Cash |

has

|  |  |
| --- | --- |
| Company | Suppliers |

has

|  |  |
| --- | --- |
| Company | Products |

5.3 ENTITY RELATIONSHIP DIAGRAM

5.4 SCHEMA DIAGRAMS

|  |  |  |
| --- | --- | --- |
|  | USER |  |
| Attributes | Type | Size |
| Username | VARCHAR | 15 |
| Full name | VARCHAR | 20 |
| Password | VARCHAR | 8-15 |
| Email | VARCHAR | 30 |
| Present Address | VARCHAR | 200 |
| Contact number | VARCHAR | 15 |

|  |  |  |
| --- | --- | --- |
|  | ADMINISTRATOR |  |
| Attributes | Type | Size |
| Username | VARCHAR | 15 |
| Backup Question | VARCHAR | 200 |
| Answer | VARCHAR | 200 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | SALESPERSON |  |
| Attributes | Type | Size |
| Username | VARCHAR | 15 |
| Permanent address | VARCHAR | 200 |
| Date of recruitment | DATE? | ??? |
| Salary | NUMBER | 10 |
| National ID | VARCHAR | 30 |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | SHAREHOLDER |  |
| Attributes | Type | Size |
| Username | VARCHAR | 15 |
| Permanent address | VARCHAR | 200 |
| National ID | VARCHAR | 30 |
| Investment | NUMBER | 10 |
|  |  |  |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
|  | PRODUCT |  |
| Attributes | Type | Size |
| Product name | VARCHAR | 20 |
| Product ID/ PID | VARCHAR | 20 |
| Product Type/ P-Type | VARCHAR | 20 |
| Component | VARCHAR | 50 |
| Company name | VARCHAR | 50 |
| Cost price | NUMBER | 10 |
| Manufactured date | DATE | ?? |
| Expiry date | DATE | ?? |
| Discount | NUMBER | 10 |
| Sales frequency | NUMBER | ???? |

|  |  |  |
| --- | --- | --- |
|  | SUPPLIER |  |
| Attributes | Type | Size |
| Supplier name | VARCHAR | 20 |
| Supplier address | VARCHAR | 200 |
| Supplier contact number | VARCHAR | 15 |
| Company name | VARCHAR | 50 |
| Joining date | DATE | ?? |

|  |  |  |
| --- | --- | --- |
|  | COMPANY |  |
| Attributes | Type | Size |
| Company name | VARCHAR | 20 |
| Company e-mail | VARCHAR | 30 |
| Company Contact number | VARCHAR | 15 |
| Company address | VARCHAR | 200 |

|  |  |  |
| --- | --- | --- |
|  | TRANSACTION INFORMATION |  |
| Attributes | Type | Size |
| Transaction Information/TID | VARCHAR | 20 |
| Product name | VARCHAR | 20 |
| Quantity | NUMBER | 10 |
| Date | DATE | ?? |
| Username(salesperson) | VARCHAR | 20 |

|  |  |  |
| --- | --- | --- |
|  | MAINTENANCE EXPENDITURES |  |
| Attributes | Type | Size |
| Expenditure Transaction ID/ETID | VARCHAR | 20 |
| Expenditure Transaction Type/ET-type | VARCHAR | 20 |
| Expenditure Transaction amount/ET-amount | NUMBER | 10 |
| Username(Recipient) | VARCHAR | 20 |
| Date | DATE | ?? |
| Remarks | VARCHAR | 200 |

|  |  |  |
| --- | --- | --- |
|  | CUSTOMER |  |
| Attributes | Type | Size |
| Customer name | VARCHAR | 20 |
| Customer contact number | VARCHAR | 30 |
| Customer address | VARCHAR | 20 |
| National ID/NID | VARCHAR | 30 |
| Pending due | NUMBER | 10 |

|  |  |  |
| --- | --- | --- |
|  | CASH DETAILS |  |
| Attributes | Type | Size |
| Assets | NUMBER | 10 |
| Debtor’s amount | NUMBER | 10 |
| Creditor’s amount | NUMBER | 10 |
| Profit | NUMBER | 10 |