PROJECT REPORT
ON
HR DATA ANALYSIS

BY

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1. Introduction

Background Introduction

Human Resource (HR) departments play a vital role in managing the most important asset of any organization: its people. The data collected by HR departments can provide valuable insights into employee performance, satisfaction, and overall organizational health. However, raw HR data is often messy and unstructured, containing unnecessary columns, redundant entries, inconsistent data formats, and missing values. This unclean data can lead to inaccurate analyses and poor decision-making.

Data analysis in HR involves scrutinizing various aspects of employee data, including recruitment, training, performance, compensation, and attrition rates. By systematically cleaning and preparing this data, organizations can uncover patterns and trends that help optimize HR strategies, enhance employee engagement, and improve operational efficiency.

Aim

The aim of this project is to undertake a comprehensive data cleansing and preparation process on an HR dataset using MySQL. The primary goal is to transform the raw, unstructured data into a clean, structured format that is ready for detailed analysis and reporting. This will involve a series of steps including the removal of unnecessary columns, renaming of columns for clarity, elimination of redundant entries, sanitization of specific columns, and handling of missing values.

Purpose of the System

The purpose of this system is multifaceted:

- Accuracy and Reliability: Ensure that the HR data is accurate and reliable, which is crucial for any subsequent analyses or reporting.
- Improved Decision-Making: Enable HR managers and decision-makers to derive meaningful insights from the data, leading to informed decisions regarding recruitment, training, and retention.
- Efficiency: Streamline the data preparation process, making it easier to update and maintain the dataset over time.
- Compliance: Ensure that the data adheres to regulatory and compliance standards, particularly in terms of data privacy and security.
- Usability: Enhance the usability of the data by organizing it in a clear and understandable format, making it accessible for various stakeholders within the organization.

2. Analysis

Hardware and Software Requirements

➢ Hardware System Configuration

- **processor - Pentium – IV**
- **RAM - 4 GB (min)**
- **Hard Disk - 20 GB**

➢ Software System Configuration

- **Operating System : Windows 7 or 8**
- **Software : MySQL Workbench**

Feasibility Study

- **Technical Feasibility**

The project is technically feasible as MySQL provides robust tools for data manipulation and cleansing. MySQL Workbench offers an intuitive interface for executing SQL queries and managing databases.

- **Economic Feasibility**

The cost involved is minimal since MySQL is an open-source database management system. The primary investment would be in hardware, which is a standard requirement for most IT departments.

- **Operational Feasibility**

The operational feasibility is high as the project involves standard data cleansing practices which are well-understood and can be executed efficiently with SQL commands.

3. Design

Block Diagram

The block diagram below illustrates the flow of the data cleansing process:

```
+---------------------+
|    Data Import      |
|  (Load Raw HR Data) |
+----------+----------+
           |
           v
+---------------------+
| Remove Unnecessary |
|      Columns        |
+----------+----------+
           |
           v
+---------------------+
|   Rename Columns    |
| (to Meaningful Names) |
+----------+----------+
           |
           v
```

```
+--------------------+
| Eliminate Redundant |
|     Entries       |
+----------+----------+
          |
          v
+--------------------+
| Sanitize Specific   |
|     Columns       |
+----------+----------+
          |
          v
+--------------------+
|  Handle NaN Values |
+--------------------+
```

4. Methodology

The following steps outline the methodology used for the data cleansing process:

1. **Data Import:** Load the raw HR dataset into a MySQL database.
2. **Remove Unnecessary Columns:** Identify and remove columns that are not needed for analysis.
3. **Rename Columns:** Change column names to more meaningful and user-friendly names.
4. **Eliminate Redundant Entries:** Identify and remove duplicate records to ensure each entry is unique.
5. **Sanitize Specific Columns:** Cleanse specific columns to standardize data formats, remove invalid characters, and correct data entries.
6. **Handle NaN Values:** Identify and handle missing values by either filling them with appropriate data or removing the rows/columns.
7. Convert categorical data to numerical data

5. CODING AND IMPLEMENTATION

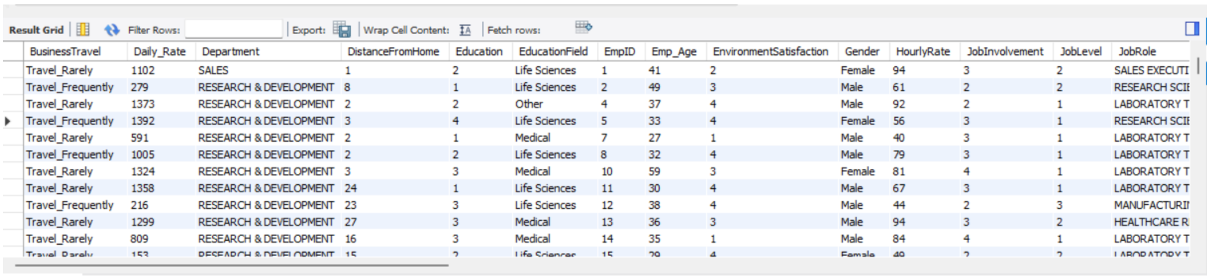
1. Create Database

```
create database hr;

use hr;
```

2. Import .CSV file

```
select * from hr_data;
```



BusinessTravel	Daily_Rate	Department	DistanceFromHome	Education	EducationField	EmpID	Emp_Age	EnvironmentSatisfaction	Gender	HourlyRate	JobInvolvement	JobLevel	JobRole
Travel_Rarely	1102	SALES	1	2	Life Sciences	1	41	2	Female	94	3	2	SALES EXECUTI
Travel_Frequently	279	RESEARCH & DEVELOPMENT	8	1	Life Sciences	2	49	3	Male	61	2	2	RESEARCH SCII
Travel_Rarely	1373	RESEARCH & DEVELOPMENT	2	2	Other	4	37	4	Male	92	2	1	LABORATORY T
Travel_Frequently	1392	RESEARCH & DEVELOPMENT	3	4	Life Sciences	5	33	4	Female	56	3	1	RESEARCH SCII
Travel_Rarely	591	RESEARCH & DEVELOPMENT	2	1	Medical	7	27	1	Male	40	3	1	LABORATORY T
Travel_Frequently	1005	RESEARCH & DEVELOPMENT	2	2	Life Sciences	8	32	4	Male	79	3	1	LABORATORY T
Travel_Rarely	1324	RESEARCH & DEVELOPMENT	3	3	Medical	10	59	3	Female	81	4	1	LABORATORY T
Travel_Rarely	1358	RESEARCH & DEVELOPMENT	24	1	Life Sciences	11	30	4	Male	67	3	1	LABORATORY T
Travel_Frequently	216	RESEARCH & DEVELOPMENT	23	3	Life Sciences	12	38	4	Male	44	2	3	MANUFACTURII
Travel_Rarely	1299	RESEARCH & DEVELOPMENT	27	3	Medical	13	36	3	Male	94	3	2	HEALTHCARE R
Travel_Rarely	809	RESEARCH & DEVELOPMENT	16	3	Medical	14	35	1	Male	84	4	1	LABORATORY T
Travel_Rarely	153	RESEARCH & DEVELOPMENT	15	2	Life Sciences	15	29	4	Female	49	2	2	LABORATORY T

3. Remove Unnecessary Columns

```
ALTER TABLE hr_data

DROP COLUMN EmployeeCount,

DROP COLUMN Over18,

DROP COLUMN StandardHours;
```

4. Rename Columns

```
ALTER TABLE hr_data

CHANGE COLUMN EmployeeNumber EmpID INT,

CHANGE COLUMN DailyRate Daily_Rate INT,

CHANGE COLUMN ï»¿Age Emp_Age INT,

CHANGE COLUMN MonthlyIncome Monthly_Rate bigint,

CHANGE COLUMN MonthlyRate Monthly_Income bigint;

SELECT EmpID, COUNT(*)
```

```
FROM hr_data
GROUP BY EmpID
HAVING COUNT(*) > 1;
```

5. Eliminate Redundant Entries

```
CREATE TEMPORARY TABLE TempTable AS
SELECT DISTINCT empid, dept
FROM test;

select * from temptable;

truncate table test;

INSERT INTO test (empid, dept)
SELECT empid, dept
FROM TempTable;

drop temporary table TempTable;
```

6. Sanitize Specific Columns

```
UPDATE hr_data
SET JobRole = TRIM(UPPER(JobRole)),
    Department = TRIM(UPPER(Department));
```

7. Handle NaN Values

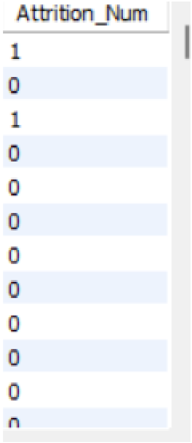
```
DELETE FROM hr_data
WHERE Emp_Age IS NULL
OR Attrition IS NULL
OR BusinessTravel IS NULL
OR Daily_Rate IS NULL
OR Department IS NULL
OR DistanceFromHome IS NULL
OR Education IS NULL
OR EducationField IS NULL
OR EmpID IS NULL
OR EnvironmentSatisfaction IS NULL
OR Gender IS NULL
OR HourlyRate IS NULL
OR JobInvolvement IS NULL
OR JobLevel IS NULL
OR JobRole IS NULL
OR JobSatisfaction IS NULL
OR MaritalStatus IS NULL
OR Monthly_Rate IS NULL
OR Monthly_Rate IS NULL
OR NumCompaniesWorked IS NULL
OR OverTime IS NULL
OR PercentSalaryHike IS NULL
OR PerformanceRating IS NULL
OR RelationshipSatisfaction IS NULL
OR StockOptionLevel IS NULL
OR TotalWorkingYears IS NULL
OR TrainingTimesLastYear IS NULL
OR WorkLifeBalance IS NULL
OR YearsAtCompany IS NULL
OR YearsInCurrentRole IS NULL
OR YearsSinceLastPromotion IS NULL
OR YearsWithCurrManager IS NULL;
```

8. Additional Changes:

- Convert categorical data to numerical data.

```
UPDATE hr_data
SET Attrition_Num = CASE
    WHEN Attrition = 'Yes' THEN 1
    WHEN Attrition = 'No' THEN 0
    ELSE NULL
END;

ALTER TABLE hr_data
DROP COLUMN Attrition;
```



Attrition_Num
1
0
1
0
0
0
0
0
0
0
0
0

5. Discussion

Results and Observations

The data cleansing process was executed successfully, resulting in a clean and reliable HR dataset. Unnecessary columns were removed, columns were renamed for better readability, redundant entries were eliminated, specific columns were sanitized, and missing values were handled appropriately.

Challenges and Solutions

- **Challenge:** Handling a large volume of data efficiently.
    - **Solution:** Used MySQL indexing and optimized queries to improve performance.
- **Challenge:** Ensuring data accuracy during the sanitization process.
    - **Solution:** Implemented validation checks and cross-referenced data entries.

Future Enhancements

- Automating the data cleansing process using stored procedures.
- Implementing advanced data validation rules.
- Integrating with data visualization tools for better insights.