**BA 574-400 Data Management**

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**Final Group Project**

**ABC Store Database Design and Implementation**

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**1. Executive Summary**

ABC Game Store, a console games retailer, has shown a rapid growth since its start of business. As it grew, the store faced a number of challenges related to low customer satisfaction. Customers were complaining about in-store customer service, however, the current data held by the business could not generate any meaningful insights and also could not load any data related to solve the problem. To solve the problem, the business needed information generated by customers, transactions, products, product display, employee, employee schedule and employee rating data. With the new database system, the ABC game store was able to yield meaningful reports. Through the proposed database, the business can generate monthly sales reports based on customer information, monthly reports on employees’ customer service assessment, and report on peak hours and the current situation. These reports can facilitate the building of a positive customer in-store experience.

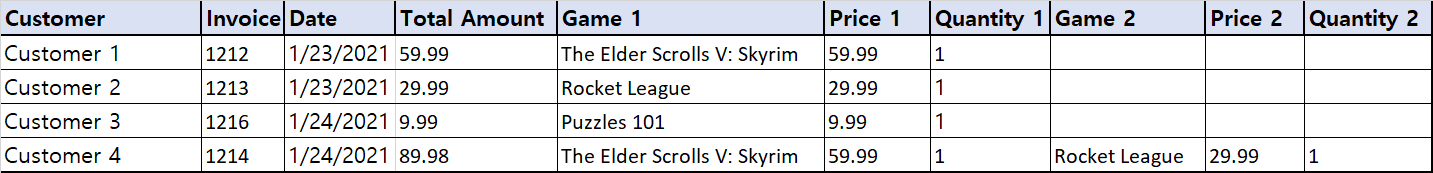
According to DBLC, the database for the business is in the fourth phase, testing and evaluation. The project has finished initial study, design, and implementation and loading phase and needs to take further actions in testing and evaluation, operation, and maintenance and evolution phase. The database needs to iteratively make improvements to address problems occurring. Iteration of the updating the database will eliminate the bottlenecks of ABC game store business and potentially impact on creating additional economic values and securing customer loyalty.

**2. Introduction**

2.1) Business Situation

ABC Game Store, a game store located in Corvallis OR, has been doing business in the town for a year and half. The store is an official partner retailer that exclusively sells console games, a physical hard copy that allows games to be played on specific platform consoles. Ever since the store started its business, revenue has been steadily increasing. The success is known for providing customers a wide range of games from diverse platforms. It possesses everything from popular to rare games. Due to the fact, many console game enthusiasts began to come to buy games. The store grew rapidly, where the number of new customers and existing customers rose significantly. However, customers were unsatisfied with its service. More and more customers were complaining about poor customer service in store. Problems arose since there was no data to respond to customers’ complaints. The store began to reach its limit with the current spreadsheet which could not generate any meaningful information to engage with customers. As shown in Table 1, the spreadsheet only contained the data of transactions.

Table 1. Current spreadsheet that ABC store is using to keep track of its sales.



2.2) Business Problems

Customers were complaining about in-store customer service. First, customers were complaining about employees. Employees were not providing consistent services to the customers. The customer service varied depending on the day of week, and time. In addition, even at the same time some employees were friendly whereas other employees were unfriendly. Furthermore, employees had problems responding to customers’ inquiries because they did not have sufficient data or information on customers, and products. For example, an employee could not answer an inquiry from a customer who came to buy a present for his/her grandson when he/she asked “What is the most popular game among teenage boys?”.

Second, customers claimed low satisfaction due to long check-out time, insufficient number of employees to get help, and no ease of finding products. These complaints were yielded since ABC store’s spreadsheet focused on transaction records rather than on customers, making it difficult to provide high quality customer service. In addition, the existing spreadsheet alone cannot generate any significant reports to solve the problem and take actions.

**3. Information Requirement**

ABC Game Store has provided customer service in store such as help desk, payment, and after service. However, the business needs more information from a new database to improve in-store customer experience and satisfaction.

To provide better quality in-store customer service, the employee should know information about customers and games in advance such as “What game products did customers buy the most and what are their preferences by gender or age group?”, “Which game should the store recommend to customers?”

Moreover, in order to solve the problem of long-waiting time to check-out, the store requires information such as “When is the peak time for customers and how many employees should be deployed in that particular time?”.

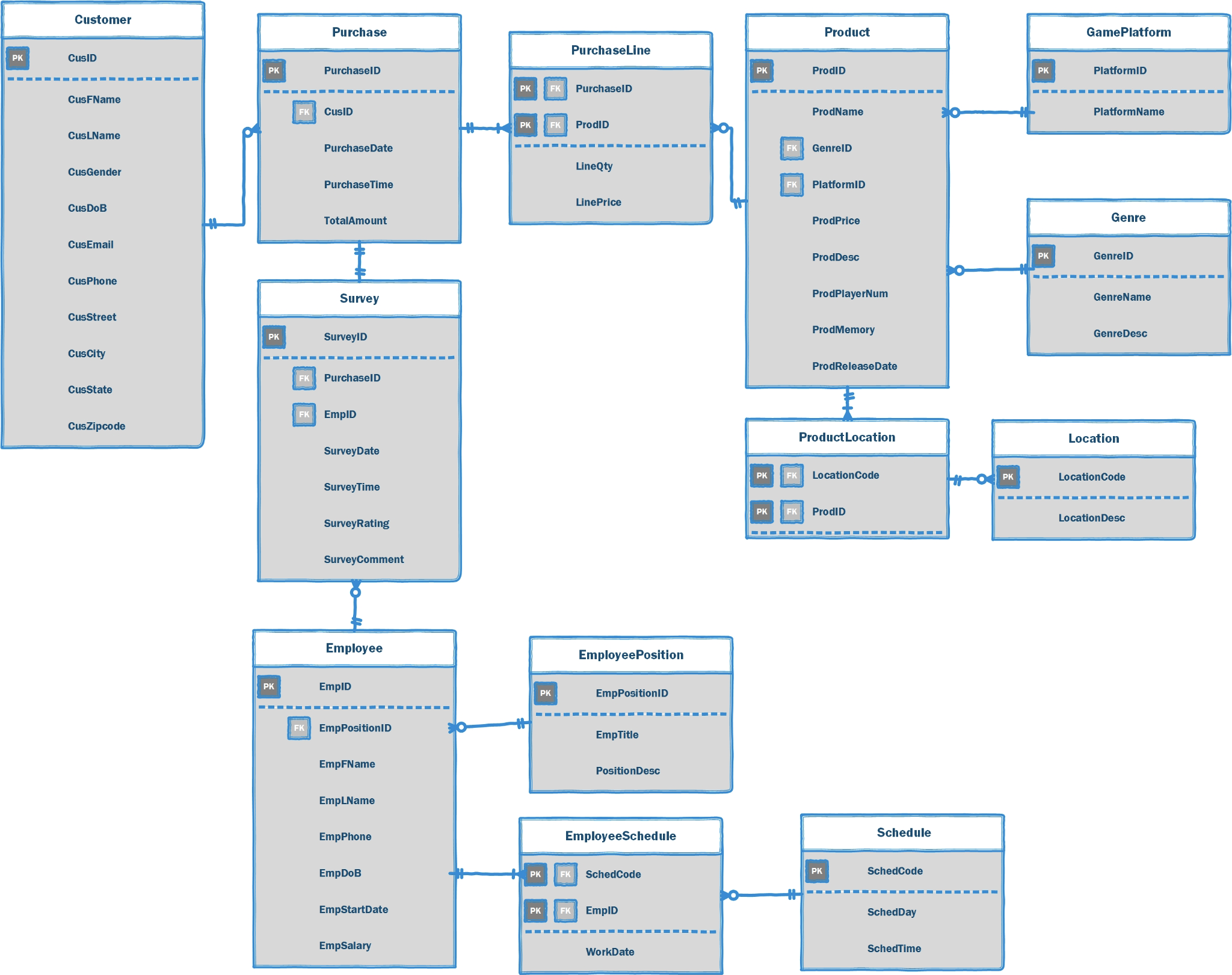
Furthermore, the store realized that it is essential to get employee ratings from customers to increase customer satisfaction. According to the rating, employees will be assigned to take additional training or get incentive. To implement a human resource management system, the store needs information such as “Which employees consistently responded to customers with poor performance and which employees have received high praise?”, “Who are the low-rating employees who need to be trained?”, etc.

**4. Conceptual Design: ERD and Business Rule**

4.1) ERD Design

To support the business, the conceptual database is designed as Figure 1. This ERD design will support the business goal of improving customer satisfaction.

Figure 1. ERD Design for ABC Game Store database



4.2) Design Explanation (Business Rules, Cardinalities)

1. Customer, Purchase tables cardinality is many-to-one (M:1). One customer can have zero or multiple purchases. One purchase ID can be generated by one customer.
2. Purchase, Product tables cardinality is many-to-many (M:N). One purchase record can have one or multiple products. One product can be purchased zero or multiple times. To solve the M:N relationship, ‘PurchaseLine’ bridge entity was created. Purchase, PurchaseLine tables cardinality is now an M:1 relationship, where one PurchaseID can have one or more in PurchaseLine. PurchaseLine, Product tables cardinality is now an M:1 relationship, where one ProdID can have zero or more in PurchaseLine.
3. Product, GamePlatform tables cardinality is many-to-one (M:1). One product can have one platform. One platform can have zero or multiple products.
4. Product, Genre tables cardinality is many-to-one (M:1). One product can have one and only genre. One genre can have zero or multiple products.
5. Location, Product tables cardinality is many-to-many (M:M). One location can hold zero or multiple products, and one product can be displayed in one or more locations. To solve the relationship, ‘ProductLocation’ bridge entity was created.
6. Purchase, Survey tables cardinality is many-to-one (M:1). One purchase ID can generate one and only survey ID, and one survey ID can be made by one and only purchase ID.
7. Employee, Survey tables cardinality is many-to-one (M:1). One employee can have zero or multiple survey records, whereas one survey ID can rate only one employee.
8. Employee, EmployeePosition tables cardinality is many-to-one (M:1). One employee can have only one position, and one position can have zero or multiple employees.
9. Employee, Schedule tables cardinality is many-to-many (M:M). One employee can have zero or more schedules. One schedule time/day can have multiple employees working in a store. To solve the relationship, a bridge entity ‘EmployeeSchedule’ is created. Now, Employee - EmployeeSchedule, and Schedule - EmployeeSchedule tables cardinality is many-to-one (M:1).

**5. Implementation: Tables and Sample Data**

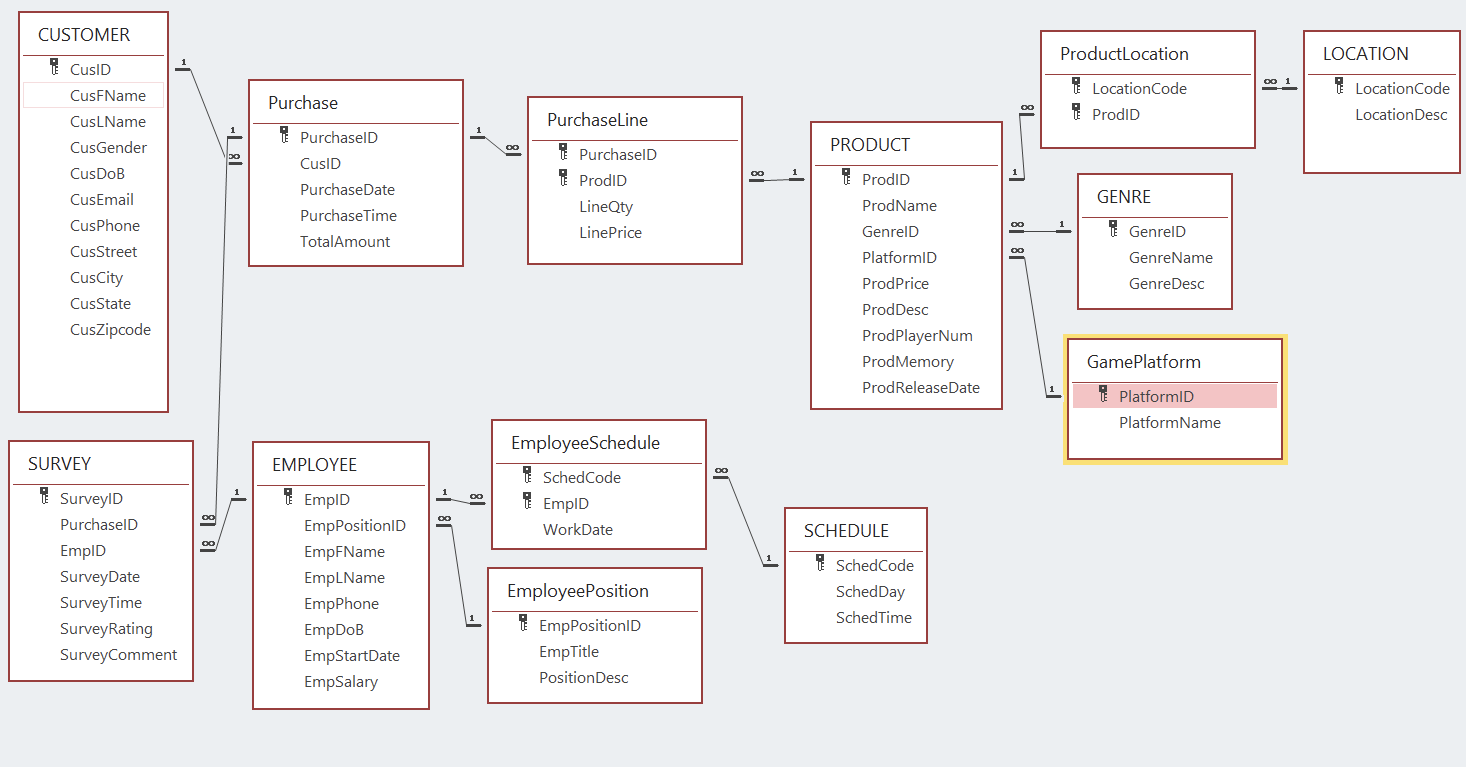
5.1) Tables and Sample Data

Tables and sample data can be observed in BA574-400 Group 2 Access file.

5.2) Data Diagram

Data diagram for the ABC game store is depicted below. The diagram shows table names and attributes names. Moreover, primary keys are shown by the key icons and foreign keys are shown through the lines.

Figure 2. Data diagram for ABC Game Store



5.3) Explanation of Metadata

Two most important tables are ‘Customer’ and ‘Employee’ since these tables play a significant role in solving the problems ABC Game Store has.

1. Customer Table Columns Metadata

Customer ID consists of fixed-length characters data up to 5 characters. CusFName, and CusLName consist of variable-length characters data up to 20 and are set as not null. CusGender consists of one character M(Male) and F(Female) for each row and is set as not null. CusDoB consists of date format, which stores dates in the Julian date format. CusEmail consists of variable-length characters up to 20 and is set as not null. CusPhone is made up of fixed-length characters up to 12 and is set as not null. CusStreet is a part of the customer’s address which consists of variable-length characters up to 50 and is not null. CusCity consists of variable-length characters up to 50 and is not null. CusState consists of fixed-length characters of 2 characters and is set as not null. CusZipcode is the fixed-length characters up to 5 and is set as not null.

1. Employee Table Columns Metadata

EmpID consists of the fixed-length characters data up to 5. EmpPositionID consists of fixed-length character data up to 5 characters. EmpFName and EmpLName are variable-length character data up to 20 and is set as not null. EmpPhone contains 12 fixed-length characters with not null constraint. EmpDoB is in date format and is set as not null which is stored as Julian date format. EmpStartDate is also in date format and is set as not null. EmpSalary is in the format of currency and is set as not null.

**6. Business Reports**

6.1) Business Report Design 1

1. Business Report Table

Table 2. Monthly Sales-Summary Report

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Monthly Sales-Summary Report (For 1/1/2021 Thru 1/31/2021)** | | | | | | | |
| **ProdID** | **ProdName** | **Genre**  **ID** | **Total Num of Purchase** | **TNP by Male** | **TNP by Female** | **TNP**  **Under 30** | **TNP**  **Over**  **30** |
| 12134 | Rocket League | SP | 3 | 2 | 1 | 3 | 0 |
| 13456 | Rocket League | SP | 3 | 2 | 1 | 2 | 1 |
| 1868 | College | AD | 2 | 1 | 1 | 1 | 1 |
| 1869 | College II | AD | 2 | 2 | 0 | 1 | 1 |
| 32145 | Analyst II | RP | 1 | 0 | 1 | 1 | 0 |
| 32146 | Analyst III | RP | 2 | 0 | 2 | 2 | 0 |
| 42785 | Risk | ST | 2 | 2 | 0 | 1 | 1 |
| 54674 | Animal Crossing | AD | 6 | 0 | 6 | 5 | 1 |
| 63770 | Rocket League | SP | 1 | 1 | 0 | 1 | 0 |
| 6789 | The Elder Scrolls V: Skyrim | RP | 1 | 1 | 0 | 1 | 0 |
| 6790 | The Elder Scrolls V: Skyrim | RP | 1 | 0 | 1 | 1 | 0 |
| 9789 | Puzzles of The World | PZ | 2 | 1 | 1 | 2 | 0 |
| **Sum** | | | **26** | **12** | **14** | **21** | **5** |

1. A Short Narrative

Monthly Summary sales report is created to track the customer preferences of the products. The preference of customers in the report is divided into customer gender and customer age.

Through this report, ABC Game Store managers can check the total number of purchases, total purchases by male, total purchases by female, total purchase by under the age 30, and total purchase by over age 30 for each game. At the end of the table, there are ‘sum’ values for each demographic column which managers can use to analyze the sales pattern through using the summary. This month, customers who are under 30 years old bought more than customers who are over 30 years old. When these data are gathered continuously, the business can figure out the sales trend of the store.

Such information will play a significant role in deciding bestsellers and understanding well about its customers. Additionally, store employees will be able to recommend a suitable game to an appropriate customer because this report allows them to analyze the overall customer preference. Therefore, this report is useful for following reasons:

* Easy to recognize bestsellers
* Great to recommend the game for its customers
* Give a great insight in understanding customer preferences

1. SQL Queries

To generate the body of the Monthly Summary Sales Report, below 5 queries were needed and first three columns were extracted from the Product table. The data in the queries were accumulated during one month.

Query 1) Total Number of Purchase

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID AND Customer.CusID=Purchase.CusID AND Purchase.PurchaseID=PurchaseLIne.PurchaseID AND ([PurchaseDate]*  *Between #1/1/2021# And #1/31/2021#)*  *GROUP BY Product.ProdID, ProdName, GenreID;* |

Query 2) Purchase of Male Customers

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, CusGender, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID AND Customer.CusID=Purchase.CusID AND Purchase.PurchaseID=PurchaseLIne.PurchaseID AND CusGender='M' AND ([PurchaseDate]*  *Between #1/1/2021# And #1/31/2021#)*  *GROUP BY Product.ProdID, ProdName, GenreID, CusGender;* |

Query 3) Purchase of Female Customers

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, CusGender, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID AND Customer.CusID=Purchase.CusID AND Purchase.PurchaseID=PurchaseLIne.PurchaseID AND CusGender='F' AND ([PurchaseDate]*  *Between #1/1/2021# And #1/31/2021#)*  *GROUP BY Product.ProdID, ProdName, GenreID, CusGender;* |

Query 4) Purchase of Customers Under Age 30

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID AND Customer.CusID=Purchase.CusID AND Purchase.PurchaseID=PurchaseLIne.PurchaseID AND YEAR(CusDoB)>=1991 AND ([PurchaseDate]*  *Between #1/1/2021# And #1/31/2021#)*  *GROUP BY Product.ProdID, ProdName, GenreID;* |

Query 5) Purchase of Customers Over age 30

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID AND Customer.CusID=Purchase.CusID AND Purchase.PurchaseID=PurchaseLIne.PurchaseID AND YEAR(CusDoB)<=1991 AND ([PurchaseDate]*  *Between #1/1/2021# And #1/31/2021#)*  *GROUP BY Product.ProdID, ProdName, GenreID;* |

1. Tables Used to Generate the Documented Report

Customer, Purchase, Purchase Line, and Product tables were employed to generate the Monthly Summary Sales Report. Our team used the Customer table to bring out the customer demographic data. Purchase and Purchase Line tables were used to connect the customer purchase data and the products they bought. Lastly, the Product table was also used to know the corresponding game data to the purchase.

Table 3. Example of 10 Rows from Customer Table

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Customer** | | | | | | | | | | |
| **CusID** | **Cus**  **FName** | **Cus**  **LName** | **Cus**  **Gender** | **Cus**  **DoB** | **Cus**  **Email** | **Cus**  **Phone** | **Cus**  **Street** | **CusCity** | **Cus**  **State** | **Cus**  **Zip**  **code** |
| 1001 | Korbin | Sorensen | M | 4/16/1998 | k\_sore@sql.org | 5039119315 | 315 SW. E Ave | Portland | OR | 97330 |
| 1002 | EunJeong | Heo | F | 6/9/1995 | tojabi@gmail.com | 2027050133 | 330 NW 9th st | Corvallis | OR | 97330 |
| 1003 | Leonardo | Dicaprio | M | 11/11/1974 | leo@gmail.com | 2023769081 | 155 NW Kings Blvd | New York | NY | 90293 |
| 1004 | Hyomin | Shin | F | 2/19/1995 | hyo@gmail.com | 5425672901 | NS 390 Ave | San Francisco | CA | 92097 |
| 1005 | Youngryun | Choi | F | 11/7/1996 | choi@gmail.com | 5419087118 | 290 SW Sierra Blvd | Corvallis | OR | 97330 |
| 1006 | Mingxuan | Fu | F | 2/21/1994 | Fu@gmail.com | 5078772341 | NW Sequoia Ave | Eugene | OR | 97330 |
| 1007 | Liam | Smith | M | 3/2/1987 | liam@gmail.com | 9052522602 | NW Cypress Ave | Corvallis | OR | 97331 |
| 1008 | Noah | Williams | M | 10/31/1996 | hoah@gmail.com | 9020707165 | 210 SW 15th st | Corvallis | OR | 97332 |
| 1009 | Jessica | Simpson | F | 10/13/2002 | jess@gamil.com | 7315031766 | 760 SW May Ave | Sacramento | CA | 92094 |
| 1010 | Oliver | Jones | M | 8/27/2007 | oil@yahoo.com | 5412766343 | 320 SW Morris Ave | Corvallis | OR | 97330 |

Table 4. Example of 10 Rows from Purchase Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Purchase** | | | | |
| **PurchaseID** | **CusID** | **PurchaseDate** | **PurchaseTime** | **TotalAmount** |
| 1212 | 1001 | 1/23/2021 | 10:43:00 AM | 89.98 |
| 1213 | 1002 | 1/23/2021 | 11:01:00 AM | 29.99 |
| 1214 | 1005 | 1/23/2021 | 11:45:00 AM | 84.98 |
| 1215 | 1001 | 1/23/2021 | 11:52:00 PM | 29.99 |
| 1216 | 1004 | 1/23/2021 | 12:15:00 PM | 9.99 |
| 1217 | 1009 | 1/24/2021 | 9:10:00 AM | 59.99 |
| 1218 | 1008 | 1/24/2021 | 11:30:00 AM | 34.98 |
| 1219 | 1010 | 1/24/2021 | 11:38:00 AM | 15.99 |
| 1220 | 1011 | 1/24/2021 | 12:25:00 PM | 24.99 |
| 1221 | 1012 | 1/24/2021 | 12:32:00 PM | 24.99 |

Table 5. Example of 10 Rows from PurchaseLine Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Purchase Line** | | | |
| **PurchaseID** | **ProdID** | **LineQty** | **LinePrice** |
| 1212 | 63770 | 1 | 29.99 |
| 1212 | 6789 | 1 | 59.99 |
| 1213 | 12134 | 1 | 29.99 |
| 1214 | 1868 | 1 | 24.99 |
| 1214 | 32146 | 1 | 59.99 |
| 1215 | 13456 | 1 | 29.99 |
| 1216 | 54674 | 1 | 49.99 |
| 1216 | 9789 | 1 | 9.99 |
| 1217 | 32146 | 1 | 59.99 |
| 1218 | 1869 | 1 | 24.99 |

Table 6. Example of 10 Rows from Product Table

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Product** | | | | | | | | |
| **Prod**  **ID** | **Prod**  **Name** | **Genre**  **ID** | **Platform**  **ID** | **Prod**  **Price** | **ProdDesc** | **Prod**  **Player**  **Num** | **Prod**  **Memory** | **Prod**  **Release**  **Date** |
| 12134 | Rocket League | SP | 2 | 29.99 | Competitive 3v3 soccer but with rocket cars. | 3 | 50 | 3/10/2015 |
| 13456 | Rocket League | SP | 1 | 29.99 | Competitive 3v3 soccer but with rocket cars. | 3 | 50 | 3/10/2015 |
| 1868 | College | AD | 3 | 24.99 | What will you study? Will you flunk out of school or earn honors status? | 1 | 78 | 3/10/2016 |
| 1869 | College II | AD | 3 | 24.99 | Freshman year at Oregon State University, how will you define your college experience? | 1 | 254 | 3/10/2017 |
| 3214 | The Legend of Zelda: Breath of The Wild | AA | 3 | 39.99 | Awaken from a 100 year slumber to explore and protect your region as Link. | 1 | 64 | 3/10/2017 |
| 32145 | Analyst II | RP | 2 | 59.99 | Take on the role of a new hire at the renowned Database Management corporation. | 1 | 62 | 3/10/2015 |
| 32146 | Analyst III | RP | 2 | 59.99 | Take on the role of an analyst and improve data management of Fortune 500 businesses. | 1 | 128 | 3/10/2019 |
| 42785 | Risk | ST | 3 | 15.99 | Your favorite board game brought to your gaming console. | 4 | 28 | 3/10/2016 |
| 42787 | Risk | ST | 2 | 15.99 | Your favorite board game brought to your gaming console. | 4 | 28 | 3/10/2016 |
| 6789 | The Elder Scrolls V: Skyrim | RP | 1 | 59.99 | A role-playing game set in the world of Skyrim. The 5th installation in the Elder Scrolls series. | 1 | 500 | 3/10/2011 |

1. Description of the Data Sources

The data from the ‘Monthly Sales-Summary Report’ is generated by several business activities.

* The Customer table is used to distinguish demographic attributes by customers’ information. The customer table contains a list of all customers who have signed up for the ABC store membership program.
* The Purchase and PurchaseLine table list the number of purchases summarized on the report. The data is collected from transactions related with customers and products. Transactions are entered into the system by employees when a customer purchases a product.
* The Product table data is used as a standard which is used to find out the most popular game (purchased game) by its name. The data is stored when the business buys a new game from a specific platform company. When new products come in, the data about a game is stored in the table.

6.2) Business Report Design 2

1. Business Report Table

Table 7. Example of Monthly Training Employee Summary Report

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Employee Training Review Summary** | | | | |
| **For 1/1/2021 thru 1/31/2021** | | | | |
| **Emp Name** | Num Of Survey | Num Of Comment | TrainRate | Phone |
| **Issac, Thomas** | 6 | 4 | 2.2 | 5145925332 |
| **Wilfred, Miller** | 1 | 1 | 2 | 9626064994 |

Table 8. Example of Monthly Incentive Employee Summary Report

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Employee Incentive Review Summary** | | | | |
| **For 1/1/2021 thru 1/31/2021** | | | | |
| **Employee’s Name** | Num Of Survey | Num Of Comment | IncentiveTate | CurrentSalary |
| **Elmer, Matthews** | 1 | 0 | 5 | $14.00 |
| **Lorenzo, Allison** | 1 | 1 | 5 | $15.00 |
| **Virginia, Hart** | 1 | 1 | 4.5 | $13.25 |

1. A Short Narrative

To improve customers’ shopping experiences, the ABC store decided to start an 'Employee Review system'. The store introduced employee re-training/incentive system depending on customers' ratings. In this new system, customers will be able to rate the employee who helped them while they are spending time in the store. Once the customer checks out at the cashier desk, a cashier will ask about their experience with the store's employee, the customer then rates the employee from 1-5 and makes some comment following by their experience. Managers will make decisions whether the employee needs training or needs to get incentive by checking the monthly average survey rating. The full point of survey rate is 5, if the average rate is higher than 4.5, the manager should provide incentive to the employee. If the average rate is lower than 2.5, the manager should re-train the employee. If the average rate is between 2.5 and 4.5, no action is required. Through introducing this new employee rating system, the ABC game store can expect to gain benefits as follow:

* Easy to review employee’s work and react based on different purpose
* Able to improve the service quality
* Able to respond to customers’ feedback
* Can expect to secure regular customers and increase sales due to improved customer service quality

1. SQL Queries

For the monthly Employee Review report, the date range could change depending on needs. The normal monthly date range is from the first day of the month to the last day of the month. These dates embedded in the first queries that produce the report.

Query 1) Find each employees’ average score and name it as ‘Business\_T2\_1 Table’

|  |
| --- |
| *SELECT EMPLOYEE.EmpFName, Count(SURVEY.SurveyID) AS CountOfSurvey, ROUND(Avg(SurveyRating),1) AS AvgOfRating, Count(SURVEY.SurveyComment) AS CountOfComment*  *FROM SURVEY, EMPLOYEE*  *WHERE SURVEY.EmpID = EMPLOYEE.EmpID And SurveyDate >=#1/1/2021# And SurveyDate <=#1/31/2021#*  *GROUP BY EMPLOYEE.EmpFName*  *ORDER BY EMPLOYEE.EmpFName;* |

Query 2) Find employees whose average rating score is less than 2.5.

(Based on the result from the assessment report, this lists the employees’ names who need training for the month.)

|  |
| --- |
| *SELECT EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName AS EmpName, Max(CountOfSurvey) As NumOfSurvey, Max(CountOfComment) As NumOfComment, Max(Business\_T2\_1.AvgOfRating) AS TrainRate, Max(EMPLOYEE.EmpPhone) As Phone*  *FROM EMPLOYEE, Business\_T2\_1*  *WHERE EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName = Business\_T2\_1.EmpName And AvgOfRating <= 2.5*  *GROUP BY EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName*  *ORDER BY EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName;* |

Query 3) Find employees whose average rating score is more than 4.5

(Based on the result from the assessment report, it will determine which employees should earn incentive)

|  |
| --- |
| *SELECT EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName AS EmpName, Max(CountOfSurvey) As NumOfSurvey, Max(CountOfComment) As NumOfComment, Max(Business\_T2\_1.AvgOfRating) AS IncentiveRate, Max(EMPLOYEE.EmpSalary) AS CurrentSalary*  *FROM EMPLOYEE, Business\_T2\_1*  *WHERE EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName = Business\_T2\_1.EmpName And AvgOfRating >= 4.5*  *GROUP BY EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName*  *ORDER BY EMPLOYEE.EmpFName+", "+EMPLOYEE.EmpLName;* |

1. Tables Used to Generate the Documented Report

Employee table, Survey table, and Business\_T2\_1 which was generated by using Employee and Survey tables. These tables were employed to generate the ‘Monthly Employee Review Report’. Employee table was used to identify the employees’ information and salary. Survey table was used to collect the customers’ feedback on employees. Lastly, Business\_T2\_1 table was used to extract the information to help the managers understand individuals’ monthly ratings and their behavior to make further decisions.

Table 9. Example of 10 Rows from Employee Table

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Employee** | | | | | | | |
| **Emp**  **ID** | **Emp**  **PositionID** | **Emp**  **FName** | **Emp**  **LName** | **EmpPhone** | **EmpDoB** | **EmpStartDate** | **EmpSalary** |
| 50001 | J001 | Stacy | Lamb | 5032938879 | 10-Nov-90 | 9/15/2007 | $6,000.00 |
| 50002 | J002 | Woodrow | Hines | 8357126436 | 15-Oct-92 | 29-Jun-14 | $4,000.00 |
| 50003 | J003 | Virginia | Hart | 4056665218 | 07-Jan-84 | 18-Dec-91 | $13.25 |
| 50004 | J003 | Wilfred | Miller | 9626064994 | 26-May-90 | 08-Aug-08 | $13.25 |
| 50005 | J003 | Gene | Morton | 5823647647 | 31-May-87 | 19-Jun-94 | $16.00 |
| 50006 | J003 | Isaac | Thomas | 5145925332 | 03-Nov-73 | 15-Mar-75 | $15.00 |
| 50007 | J004 | Lorenzo | Allison | 4336542417 | 13-Nov-82 | 28-Dec-13 | $15.00 |
| 50008 | J004 | Luis | Figueroa | 6934012852 | 12-Jan-77 | 16-Mar-81 | $14.00 |
| 50009 | J004 | Duane | Fowler | 1647536424 | 17-Sep-96 | 05-Jun-05 | $14.00 |
| 50010 | J004 | Arturo | Webb | 5799478166 | 20-Jun-91 | 13-Jun-98 | $15.00 |

Table 10. Example of 10 Rows from Survey Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Survey** | | | | | | |
| **Survey**  **ID** | **Purchase**  **ID** | **Emp**  **ID** | **Survey**  **Date** | **Survey**  **Time** | **Survey**  **Rating** | **Survey**  **Comment** |
| 80001 | 1212 | 50003 | 1/23/2021 | 10:45:00 AM | 4.5 | Virginia is very kind and explained me very detail |
| 80002 | 1213 | 50004 | 1/23/2021 | 11:01:00 AM | 2 | Wilfred was very nice |
| 80003 | 1214 | 50006 | 1/23/2021 | 11:45:00 PM | 2.5 | Issac did not know the game I wanted to buy |
| 80004 | 1216 | 50006 | 1/23/2021 | 12:15:00 PM | 1 | Issac was so busy I could not even ask |
| 80005 | 1217 | 50007 | 1/24/2021 | 9:10:00 AM | 5 | Lorenzo is an expert of video game, he knows everything |
| 80006 | 1218 | 50006 | 1/24/2021 | 11:30:00 AM | 3 |  |
| 80007 | 1219 | 50006 | 1/24/2021 | 11:38:00 AM | 2 | Issac does not understand about game and he did not help me |
| 80008 | 1220 | 50006 | 1/24/2021 | 12:25:00 PM | 3 |  |
| 80009 | 1222 | 50006 | 1/24/2021 | 12:45:00 PM | 1.5 | Issac is so busy, I rather decided to find the game by myself |
| 80010 | 1223 | 50014 | 1/25/2021 | 12:59:00 PM | 4 |  |

Table 11. Example of Business\_T2\_1 Table (Query 1)

|  |  |  |  |
| --- | --- | --- | --- |
| **Employee Review Summary** | | | |
| **For 1/1/2021 thru 1/31/2021** | | | |
| **Emp Name** | Num Of Survey | Num Of Comment | TrainRate |
| **Issac, Thomas** | 6 | 4 | 2.2 |
| **Wilfred, Miller** | 1 | 1 | 2 |
| **Elmer, Matthews** | 1 | 0 | 5 |
| **Lorenzo, Allison** | 1 | 1 | 5 |
| **Virginia, Hart** | 1 | 1 | 4.5 |
| **Gladys, Mcguire** | 2 | 4.2 | 0 |

1. Description of the Data Sources

The data from this report is generated by survey collection activities and employee enroll activities.

* The Survey table is used as identifying the average rating of employees in the report. Since it is crucial to the list in the report, the survey will be asked to customers every time after check-out. Customers can choose the rating between 1 to 5, and when the survey is completed, the cashier will store the information in the survey table with date and time.
* The Employee table contains a list of all employees who are working in the store. Employee information is used in the reports for assessments. The data are entered when employees join to work with the business. The manager will record the personal data (name, contact info, DoB) and job-related data (job title and salary).

6.3) Business Report Design 3

1. Business Report Table

Table 12. Daily Transaction and Peak-Time Summary

|  |  |  |  |
| --- | --- | --- | --- |
| **Daily Transaction and Peak Time Summary** | | | |
| **2020/01/23 Saturday** | | | |
| **Code** | **Time** | **Number of Transactions** | **Number of Employees**  **Working** |
| SA01 | 9:00 -11:00 | 1 | 4 |
| SA02 | 11:00 - 13:00 | 4 | 1 |
| SA03 | 13:00 - 16:00 | 0 | 1 |
| SA04 | 16:00 - 19:00 | 0 | 1 |

1. A Short Narrative

The Daily Transaction and Peak Time Summary is run daily as part of tracking the number of customer’s purchase followed by employees' daily time shift which consist of 4 timelines (e.g., SA01, SA02, SA03 and SA04). The store manager is responsible for making well-balanced employee time shifts without causing any customer’s check-out traffic at the cashier desk. This oversight process begins by understanding the flow of purchase along with employee’s time shifts.

The report identifies the total visits (to find out the peak time), and number of employees working. The value of the information included in this report is useful for a variety of activities including:

* Identifying shifts that experience high frequency of transactions for making adjustments on employees’ schedule.
* Identifying unusual patterns of activity that might be related to holidays, events. For example, originally, Monday does not have many transactions. However, on a specific Monday, it could have an extraordinary number of purchases due to various variables such as certain holidays, events held in the region, or graduation ceremonies at local schools.

1. SQL Queries

To generate the body of the Daily Transaction and Peak Time Summary, 5 queries were needed and the first 4 queries reference the Purchase table to provide information. The data in the database is the transaction history over the course of a couple days.

Query 1) Total Number of Purchases that occurred in SA01

|  |
| --- |
| *SELECT Product.ProdID, ProdName, GenreID, COUNT(PurchaseLine.PurchaseID) AS Total\_Num\_of\_Purchase*  *FROM Product, Customer, Purchase, PurchaseLine*  *WHERE Product.ProdID=PurchaseLine.ProdID*  *AND Customer.CusID=Purchase.CusID*  *AND Purchase.PurchaseID=PurchaseLIne.PurchaseID*  *AND PurchaseDate>=#1/1/2021#*  *AND PurchaseDate<=#1/31/2021#*  *GROUP BY Product.ProdID, ProdName, GenreID;* |

Query 2) Total Number of Purchases that occurred in SA02

|  |
| --- |
| *SELECT Count( [PurchaseDate]+[PurchaseTime]) AS SA02*  *FROM PURCHASE*  *WHERE ((([PurchaseDate]+[PurchaseTime])*  *Between #1/23/2021 11:00:00# And #1/23/2021 13:00:00#));* |

Query 3) Total Number of Purchases that occurred in SA03

|  |
| --- |
| *SELECT Count( [PurchaseDate]+[PurchaseTime]) AS SA03*  *FROM PURCHASE*  *WHERE ((([PurchaseDate]+[PurchaseTime])*  *Between #1/23/2021 13:00:00# And #1/23/2021 16:00:00#));* |

Query 4) Total Number of Purchases that occurred in SA04

|  |
| --- |
| *SELECT Count( [PurchaseDate]+[PurchaseTime]) AS SA04*  *FROM PURCHASE*  *WHERE ((([PurchaseDate]+[PurchaseTime])*  *Between #1/23/2021 16:00:00# And #1/23/2021 19:00:00#));* |

Query 5) Total Number of Employees Working a specified shift on the specified date

|  |
| --- |
| *SELECT SchedCode, WorkDate, Count(Schedcode) AS [NumofEmp]*  *FROM EmployeeSchedule*  *WHERE WorkDate like '1/23/2021'*  *GROUP BY SchedCode, WorkDate;* |

1. Tables Used to Generate the Documented Report

Purchase table, and EmployeeSchedule tables were used in generating the ‘Daily Transaction and Peak-Time Summary’. Since the purpose of the report was to identify a shift that experiences a high frequency of transactions, the purchase data and time was utilized to count down the frequency. The EmployeeSchedule table was used to find the number of employees that were scheduled to work that shift.

Table 13. Example of 10 Rows from Purchase Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Purchase** | | | | |
| **PurchaseID** | **CusID** | **PurchaseDate** | **PurchaseTime** | **TotalAmount** |
| 1212 | 1001 | 1/23/2021 | 10:43:00 AM | 89.98 |
| 1213 | 1002 | 1/23/2021 | 11:01:00 AM | 29.99 |
| 1214 | 1005 | 1/23/2021 | 11:45:00 AM | 84.98 |
| 1215 | 1001 | 1/23/2021 | 11:52:00 PM | 29.99 |
| 1216 | 1004 | 1/23/2021 | 12:15:00 PM | 9.99 |
| 1217 | 1009 | 1/24/2021 | 9:10:00 AM | 59.99 |
| 1218 | 1008 | 1/24/2021 | 11:30:00 AM | 34.98 |
| 1219 | 1010 | 1/24/2021 | 11:38:00 AM | 15.99 |
| 1220 | 1011 | 1/24/2021 | 12:25:00 PM | 24.99 |
| 1221 | 1012 | 1/24/2021 | 12:32:00 PM | 24.99 |

Table 14. Example of 16 Rows from EmployeeSchedule Table

|  |  |  |
| --- | --- | --- |
| **EmployeeSchedule** | | |
| **SchedCode** | **EmpID** | **WorkDate** |
| M01 | 50014 | 1/25/2021 |
| M02 | 50014 | 1/25/2021 |
| M03 | 50015 | 1/25/2021 |
| M04 | 50015 | 1/25/2021 |
| SA01 | 50003 | 1/23/2021 |
| SA01 | 50004 | 1/23/2021 |
| SA01 | 50005 | 1/23/2021 |
| SA01 | 50006 | 1/23/2021 |
| SA02 | 50006 | 1/23/2021 |
| SA03 | 50007 | 1/23/2021 |
| SA04 | 50008 | 1/23/2021 |
| SU01 | 50007 | 1/24/2021 |
| SU02 | 50006 | 1/24/2021 |
| SU03 | 50012 | 1/24/2021 |
| SU03 | 50013 | 1/24/2021 |
| SU04 | 50008 | 1/24/2021 |

1. Description of Data Sources

The data contained in the report is generated by purchase activity and employee enrollment.

- In the Purchase table, data and time is used to generate the list. As mentioned above, the data for the purchase table is collected from transaction activities along with customer and product data.

- EmployeeSchedule table facilitated to find out how many employees worked in a specific work day and shift. This data is collected by employees and stored by the manager. Employees may have fixed or flexible time schedules and full-time and part-time schedules. Employees choose day of week (Monday to Sunday) and choose among four shifts (9am-11am, 11am-13pm, 13pm-16pm, and 16pm-19pm). Depending on employees’ opinions, the manager informs next month’s schedule and the schedule will be stored into the database.

**7. Further Improvement**

7.1) Database Life Cycle Framework and ABC Game Store Project

For a database design, six phases of the database life cycle are needed: initial study, design, implementation and loading, testing and evaluation, operation, and maintenance and evolution. The ABC game store project was carried out to the middle of the testing and evaluation phase.

First, in the initial study phase, the ABC game store's current situation is analyzed and problems are defined. The ABC game store has failed to generate meaningful outputs within the current spreadsheet because it has stored incomplete, denormalized, redundant, and not fully integrated conceptual data. Furthermore, because of failing to track the system operation, the ABC game store could not take action associated with customer dissatisfaction from the in-store customer service. Therefore, the proposed database was designed to solve the core problem, a poor in-store customer service quality, that we have identified. During the 'analyzing problems' process, we also recognized and defined two sets of limits; scope and boundaries --to improve the quality of customer service and train employees, the design will encompass the entire organization, ABC game store (extent). Also, considering ABC game store is a local-size store and the database will be used only for the internal employees, we as designers encouraged to spend the budget on using intuitive and cost-efficient software rather than spending budget on visual implementation software such as HTML.

Second, in the design phase, the information requirements were defined with the business' view and the designer’s view. It is important to take a step in identifying the real-world from the perspective of data and representing it as a conceptual model, which corresponds to a logical database design. The design process underwent three essential stages: conceptual, logical, and physical design. First, in the conceptual design process, our team created an Entity-Relation Diagram via MS Visio by changing the business requirements to a conceptual schema and specifying constraints on all sets of entities in the database and attribute relationships. Then, in the logical design process, we constructed a logically implementable data model from a conceptual design into an Excel file and decided MS Access as DBMS software. This is the process of converting to a user-recognizable form and defining a schema. For example, when creating a relational table containing customer information, it is made easy to understand by expressing it in the same form as a table consisting of items such as customer ID, name, and contact information. Lastly, in the physical design process, we went through the process of designing internal data storage structures and access paths to make the logical database structure easier for MS Access to handle. Especially we took into consideration methods of saving storage and avoiding redundancy to improve efficiency in data processing.

Third, in the implementation and loading phase, we established an actual database in MS Access using SQL queries based on what was obtained during the design process. We mainly used DDL (Data Definition Language) and DML (Data Manipulation Language) to write simple, clear, consistent SQL queries along with the business requirement analysis. After the database has been created, the data saved in the excel file was loaded into the database tables and we confirmed all of the data was in a relational database so that it can be readily extracted based on the information requirements.

Fourth, in the testing and evaluation phase, we can ensure whether the proposed database maintains the integrity and security of the data. Run simulations by extracting the data from several relational tables and making a summary report according to the queries from task 4 which may resolve the current ABC game store’s issues, we confirmed that our DBMS is in the proper use of primary and foreign key rules. This process ensured that these constraints were properly designed and implemented. In this phase, not only testing but also safe levels of data security should be guaranteed. Consequently, our team must further test for these data privacy issues such as physical security, password security, access rights, audit trails, data encryption, diskless workstations, etc. Also, to make sure the DBMS can support rapid transactions, our team needs to make sure the capacity of hardware and software is implemented with our database by fine-tuning the database. Then, we can evaluate the database and its application programs. Also, it is always crucial to ensure a plan for data loss which can be incurred by unintended deletions, power outages or other outside factors. Therefore, we should make sure to perform backup plans such as full backup, differential backup, and transaction log backup depending on the importance of the data.

Fifth, in the operation phase, real-world use of implemented databases identifies problems and improvements. In this phase, some of the issues that have not been addressed in the previous phase, testing and evaluation, might be identified and this leads to the last step, phase 6, maintenance and evolution.

Last but not least, in the maintenance and evolution phase, we can address the issues caused from the operation phase, and compare the data models, reviewing them whether they fit well together by keeping continuous enhancements.

7.2) Evaluation Revision within DBLC

Database design includes not just the process of creating a table within a database, but also the whole process of analyzing, logical, physical design, and building a database. Since database designing requires a step in identifying the real-world issues from the perspective of data and representing it as a conceptual model, which corresponds to a logical database design, it is difficult to build a complete DBMS at once. We as database designers must be prepared to perform iterative and incremental database enhancement activities including preventive, corrective, adaptive maintenance, and etc. The evaluation and revision of the database will most likely be demanded incorporating questions such as “Is the database provided updated to the most recent form?” or “Does the organization have enough quality of database structure to provide information in terms of the width and depth of business requirement?”. Therefore, in the phases between ‘implementation and loading’ and ‘testing and evaluation’, ‘evaluation and revision’ are conducted through the repetition of system implementation and creation loading fine-tuning.

A good database model should have completely defined data that business needs for improving customer experience and be able to address a number of business rules to the database. The further problems with the proposed database can be identified and enhanced as the DBLC phase goes beyond step 4, testing and evaluation, and keep evaluating and revisioning to prevent unpredictable issues such as privacy, security, additional business requirements, etc. For example, since the database contains customer’s privacy, database designers should keep on track on its security protection capacity. By protecting the data as the priority list of the evaluation revision process, it will prevent legal disputes that might occur due to information disclosure and consistent data encryption can be strengthened to enhance the security of the customer information management. In addition, by revising database access authorities continuously will benefit the store by preventing data leakage issues. Data which is confidential, for example employees’ salary, must be allowed to be searched by executives or managers. Considering long-term use of the database model, iterative database revision can optimize the advantages of relational databases along with multiple-table join operations. Also, the assignment of access permission for new and old users should be periodically renewed. Given that the data model reflects the current state of the business operation system and whether issues are being reflected without causing a bottleneck, the repeated evaluation and revision of the database can allow each step to advance the output toward the complete database model. Overall, this process encourages stability and flexibility of the database.

**8. Conclusion**

Integration and expansion of the database system can provide an essential framework for more effective marketing measures. While ABC game store’s spreadsheet is only able to track total transactions, the proposed database system can analyze customers' purchase patterns, types, and complaints through the closely connected relational table. By combining with the stored customer information and employee's rating, come up with measures to prevent the losing customer or increase the store revisit rate. However, Customer Relationship Management activities will be successful only when the data is finely maintained and kept updated. In particular, to use basic customer data to accurately continuously update the data in the database, and associate cleansing tools to the database are necessary. As the business expands, the database may need to introduce additional business rules or expand and restrict employees' access to the database. In order for the database to respond flexibly to these situations, only iterative evaluation and revision are the way to get closer to the complete Database Life Cycle.

Intuitively, most people recognize the value of a great customer experience. The brand which provides this value is the brand that the customer is willing to interact with. According to Harvard Business Review, customers who have the best customer experiences [spend 140% more](https://hbr.org/2014/08/the-value-of-customer-experience-quantified) than customers with the worst experiences. While customers who are not satisfied with the customer service will only increase by 40% sales per customer and there is little potential for revisiting the store. (Kriss *The Value of Customer Experience, Quantified*)

The introduction of ABC Game Store's new database is expected to eliminate bottlenecks in existing revenue structures and will bring additional 140% revenue growth potential, while enabling improved quality of customer service and systematic management of human resources.

**Reference**

Kriss, Peter. “The Value of Customer Experience, Quantified.” *Harvard Business Review*, 1 Aug. 2014, hbr.org/2014/08/the-value-of-customer-experience-quantified.