Database System Development and Implementation Plan

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CS660 – Database Systems

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Database System Overview

The following assignment is intended to detail the development and implementation of a purpose-built database management system for a company of our choice. They understand that the criteria for the weekly assignments require the company to provide a rationale for each submission that is consistent with the problem-based learning scenario. For this purpose, I will work with a small theoretical retail business. The company is a niche tabletop gaming and comix shop seeking to expand operations at its 2 locations by introducing more interactive opportunities, tournaments, and moving some of the supporting materials for these events and clientele to the company's online marketplace. This involves improving their current database management system and developing an online marketplace with core products available for the minimum viable product (MVP) release. The goal is to expand the benefits of these improvements substantially in the future.

General Business Environment

RPGE+ (Role Playing Games Emporium PLUS) has become an adventurous financial venture for the local community. The company began with a group of tabletop gamers who remained in contact as they pursued careers in various fields. This group reconvened in 2017 to establish the organization and opened its first retail store that January. Beginning with sales of tabletop role-playing games, classic and modern board games, and collectible card games, RPGE+ has significantly expanded its clientele and achieved the financial capacity to develop into another densely populated metro area approximately 50 miles away. Each location has an operating team of 10 staff, 4 assistant managers, 1 store manager, and a shared general manager.

Overseeing these retail operations is a core team of 5 senior stakeholder managers, covering Finance, Human Resources, Executive, Operations, and Technology.

The company operates on relatively new point-of-sale (POS) technology, a state-of-the-art Chronos time-management system, and a relatively decent HR system, all integrated into its central servers. But as the operation has expanded, they realized they are struggling with the following areas:

- Customer Management
- Inventory Control
- System Documentation
- Lack of Online Capabilities
- Lack of Events Management

We understand that the improved Customer Management system will create opportunities to offer membership, thereby enhancing marketing and enabling the company to host membership-only events at its facilities and at gaming conventions. Improving the Inventory control system will ensure optimal stock levels for all products and automate the reordering process. Providing system documentation will help establish baseline capabilities and expected thresholds for future improvements.

What we lack, but have heard strong customer demand for, is the ability to bring live events to our storefronts daily and larger events at conventions. We believe that implementing an event management and registration system will provide greater opportunities to attract existing and new customers through targeted marketing campaigns for theme nights and gaming experiences. In support of this, we also want to expand our operations to the online marketplace.

Many customers have expressed interest in ordering materials online in advance of attending events at our retail locations and major conventions.

Database System Goals and Objectives

"Database management system (DBMS) consists of a collection of interrelated data and a set of programs to access that data. The collection of data is usually referred to as a database, which contains information about one particular enterprise. The primary goal of a DBMS is to provide an environment that is both convenient and efficient for retrieving and storing database information. The DBMS is the interface between the user of application programs on one hand and the database on the other." (Your Article Library, n.d.) For our specific delivery, we are looking to improve our database management system to support the following:

- Enhanced customer management system
- Implementing a membership options program
- Protecting customer data in line with privacy regulations for retail operations
- Build out the system to improve opportunities for scalability and growth
- Incorporate interfaces and applications to support online shopping cart software
- Improve the accuracy of the inventory management system
- Improve and automate the replenishment and ordering processes
- Expand capabilities to support events management and registration for members
- Improve system integrity, making our data authentic, consistent, and accurate

Identified Problem Statement and How the Solution Aims to Resolve

RPGE+ has expanded its operations and customer base to the point that it is seeing many returning customers and a desire to expand operations further to support local events. Simultaneously, it has been identified that the existing database management system is not necessarily well-suited to supporting the transition of operations to an online market in addition to retail operations. The solution is intended to address multiple issues and ultimately develop a better operating system to support increased opportunities, improved inventory management, event planning and delivery, and an enhanced customer system to support the development and implementation of a membership perks program.

Mission Statement, Strategic Goals & How the Solution Aligns with Them

RPGE+ is a customer-centric organization that relies heavily on positive word of mouth and a continuously engaged clientele to attract the right consumers for the products offered. The organization has identified what it needs to achieve to reach the next stage of its evolution. The solution will help determine the components of the database management system required to support the company's improvements.

Mission of The Company

The high-level Mission of RPGE+ is to continuously engage the customer in innovative ways that encourage repeat visits for unique experiences. As a company that has achieved significant success in its market, it now seeks to become an industry leader by demonstrating a well-organized and efficient approach to managing events, retail functions, and day-to-day operations. RPGE+ aims to continue growing within its communities and to expand into new, promising markets.

Goals of the Company

RPGE+ intends to implement an online registration management system that can be used by customers and store staff to schedule and manage local events at both retail locations. To take advantage of this system and register, we also need to implement a customer registration system that enables us to offer a membership perks program and tiered offerings for VIP clientele. We have a goal to show we have a high return rate for our consumers and want to prove (through a variety of marketing efforts and events) that we aim to have 25% of our customers return more than twice every 60 days. We strive to increase our sales add-on rates by 15% each quarter by offering items that are more appropriately related and available both in-store and online. Finally, we aim to fully automate our inventory management system to minimize or eliminate touchpoints in reordering and to ensure that all stock remains available to our consumers.

Analysis: Fulfillment of the Mission and Goals of the Organization

In the Problem-Based Learning scenario, the company aims to improve its back-office systems, expand automation opportunities for back-office operations and systems management, increase focus on customer satisfaction, and reduce employee turnover by making it easier and more efficient for the team to perform their jobs. I am confident that the criteria I've established above achieve the same or similar goals and objectives for my example company, RPGE+. As future IP submissions address additional components of this, it is my aim that each goal be addressed and demonstrated as feasible through the database systems development and implementation plan.

Entity Relationship Model

Business Rules Enforced by Proposed DBMS

- A Customer will be uniquely linked to a single Membership ID
- One or more customers can have the exact location/address
- Memberships can be enabled for one or more Promotions simultaneously
- Memberships will be required to attend Events
- Events will track attendees by Membership ID.
- Events can offer one or more Promotions
- Events will occur at a single Location
- A Single Store will sponsor events
- Stores will be recognized as a single unique location
- An Employee is associated with a single store as their primary location
- One or more employees can have the exact location/address
- An Employee Type can be either: Associate, Assistant Manager, Manager, or Store Manager
- Products can have more than one promotion active simultaneously
- Products will be required to have: Product Name, Product Category, Reorder Quantity, and Reorder Threshold set when entering into the system.
- A Product can only exist in a single category.
- Orders can have zero or more Memberships (purchases by non-members allowed).
- Orders must be associated with a single Store
- A single Employee will enter orders

- Orders must contain one or more products.

Entitles, Attributes, Relationships & Cardinality Constraints

Entities (Tables)	Attributes (Rows)	Relationships	Cardinality Constraints
Customers	CustomerID (PK) (Char10)	Has Membership	1:1
	Customer Name (Varchar50)		
	LocationID (Char10)	Has a Location	1:Many
	MembershipID (Char10)	Directly associated with Unique Customer	1:1
	Contact eMail (VarChar200)		
	Contact Phone (Int)		
Store	StoreID (Char10)	Can Sponsor Events Can Create Orders Has a Location Has Employees	1:Many 1:Many 1:1 1:Many
	Store Name (Varchar50)		
	LocationID (Char10)	Has a Location	1:1
	OpenTimes (Varchar500)		
Employee	EmployeeID (Char10)	Associated with a Store Can Create Orders	1:1 1:Many
	Employee Type (Varchar25)		
	Employee Name (Varchar50)		
	LocationID (Char10)	Has a Location	One Location may have multiple Employees
	StoreID (Char10)	Is associated with a Store	1:1
	PayRate (Decimal 8,2)		
	Pay Frequency (Varchar20)		
Membership	MembershipID (Char10)	Requires a Customer Registers at Events Can receive Promotions	1:1 1:Many 1:Many
	Membership Type (Varchar50)		
	Membership Tier (Char2)		
	CustomerID (Char10)	Has Membership	1:1
	EventID (Char10)	Membership Required to Register	1:Many
	Total Spent (Decimal 10,2)		

Entities (Tables)	Attributes (Rows)	Relationships	Cardinality Constraints
	PromotionID (Char10)	Can have multiple Promotions	1:Many
Orders	OrderID (Char10)	Associated to a Store Initiated by Employee Can have Promotions Can have Memberships Must have Products	1:1 1:1 1:Many 1:1 1:Many
	Transaction Date (Date)		
	MembershipID (Char10)	Can have Membership	1:1
	StoreID (Char10)	Associated to Store	1:1
	EmployeeID (Char10)	Employee initiates Sale	1:1
	Total Sale (Decimal 10,2)		
	Sales Tax (Decimal 5,2)		
	PrmotionID (Char10)	Can have Promotions	1:Many
	ProductID (Char10)	Must have Products	1:Many
Promotions	PromotionID (Char10)	Can be associated to Memberships Can be Associated to Events Can be Associated to Products Directly	1:Many 1:Many 1:Many
	Promotion Name (Varchar200)		
	Promotion Type (Varchar50)		
	Discount (Decimal 5,2)		
	Date Start (Date)		
	Date End (Date)		
Products	ProductID (Char10)	May have Promotions	1:Many
	Product Name (Varchar200)		
	Product Brand (Varchar100)		
	Product Category (Varchar 50)		
	Description (Varchar2500)		
	Count Available (Int)		
	Reorder Threshold (Int)		
	Reorder Quantity (Int)		
	PromotionID (Char10)	Can have more than 1 simultaneously	1:Many
Events	EventID (Char10)	Is associated with a Store	1:1

Entities (Tables)	Attributes (Rows)	Relationships	Cardinality Constraints
		Requires Membership to Attend Performed at Location	1:Many 1:1
	Event Name (Varchar200)		
	Event Description (Varchar2500)		
	Event Date (Date)		
	Attendee Cap (Int)		
	MembershipID (Char10)	Defines Allowed Attendees	1:Many
	Count of Attendees (Int)		
	PromotionID (Char10)	Can have Promotions	1:Zero or More
	LocationID (Char10)	Performed at Location	1:1
	StoreID (Char10)	Owned by Store	1:1
Location	LocationID (Char10)	Is associated to Customers Is Associated to Employees Is Associated to Stores Is Associated to Events	1:Many 1:Many 1:1 1:Many
	Address Line 1 (Varchar150)		
	Address Line 2 (Varchar150)		
	City (Varchar50)		
	State (Char2)		
	Zip Code (Char5)		
	County (Varchar50)		
	Country (Varchar50)		

Table 1 - Entities, Attributes and Relationships

Entity Relationship Diagram

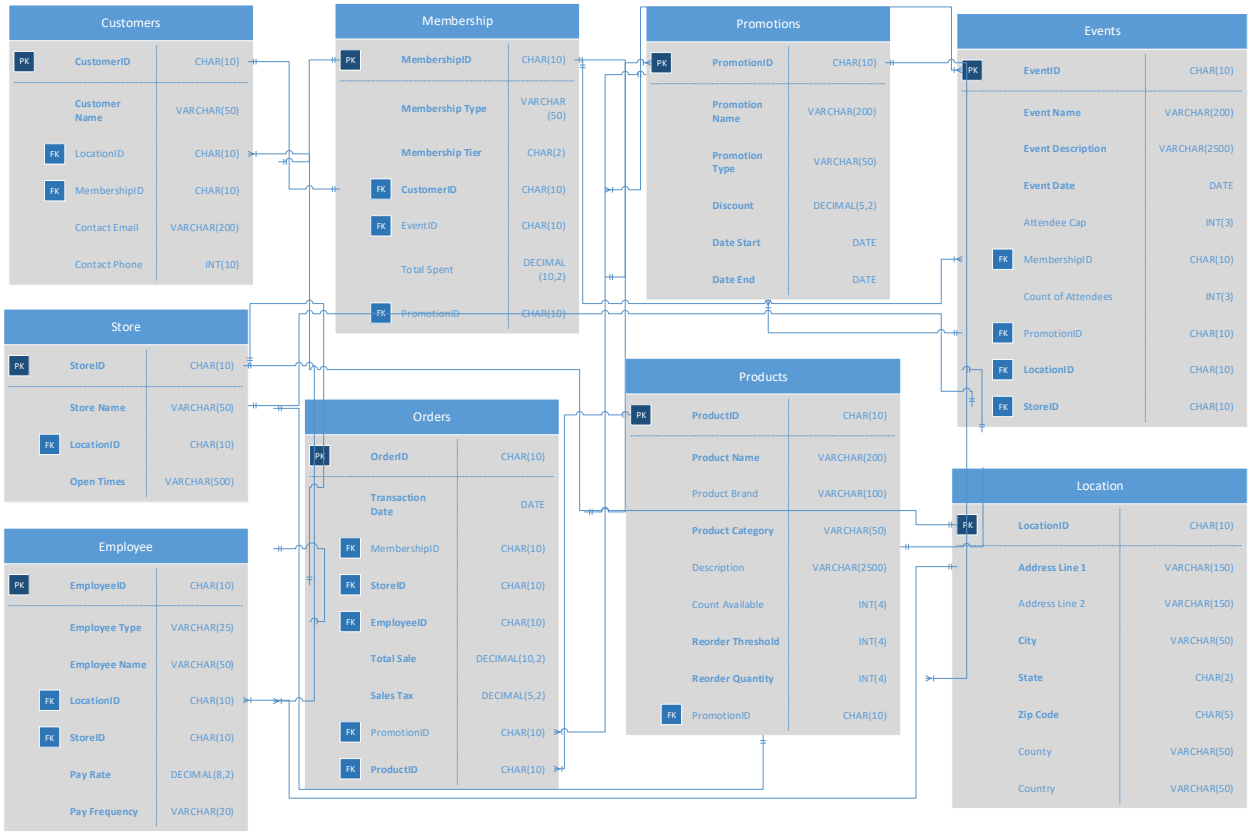

Figure 1 - ER Diagram

Analysis on Fulfillment of Mission and Goals of Case Study Organization

The specific goal of this week's update to the project was to effectively document the relational database for the proposed solution. This required diving in to an Entity Relationship Diagram model and providing context to the tables and columns down to third normal form (3NF). Before we can get there, we need to get past first and second normal form. The first normal form would have required database tables without repeating columns or sub-columns. Start here by creating unique fields and keys. Next, the Second Normal form is where "all the non-key columns are dependent on the table's primary key". (EssentialSQL, n.d.). In the customer table, fields that are not related to foreign keys in other tables should be directly related

to the unique CustomerID. In each of our tables, fields not identified by Primary or Foreign key should be directly related to the table defined. A great example of this is in the location table. All fields in the location table are geolocation fields and are not listed in other tables. They specifically apply to the LocationID.

Third Normal Form (3NF) occurs when all tables are in Second Normal Form and contain columns that are not directly dependent on other columns in the table, except through the primary key. This means that when the first column after the primary key relies on the value of the primary key, and another column in the table also relies on the primary key, that is expected. But you should not be able to say that the first column is reliant on the primary key through the second column. To be non-transitively dependent that means that all columns only depend on the primary key and nothing else in the table.

As for the mission of the company, this helps them establish their database structure to facilitate and document events, and the registration of events is now also tied to membership. They can now better promote their membership system and keep better track of promotions and apply these uniquely across both retail locations. While this doesn't answer the entire solution for online sales just yet, it helps establish a working foundation for the retail side of the house that can be easily adapted for online sales.

Structured Query Language (SQL) Scripts

DDL SQL – Create Statements

Create DDL

DML SQL – Insert, Delete & Update Statements

Update & Delete DML

REPORT SQL – Select, Crosstab & Aggregate Function Statements

Analysis: How This Fulfills the Case Study Organization Mission & Goals

This week, we have been tasked with exploring SQL functions and building our example organization's database to support the company's mission and goals. Given the number of tables and the complexity of the data, this was a substantial task to complete in a week. I found myself overanalyzing and refactoring my database after developing additional queries that would

improve data integrity for reporting. One thing that caught my attention, given my experience with sales databases, is that each table I created could have had exponentially more columns to provide a more substantial amount of data.

Two primary mission objectives the company sought to improve were customer management and inventory control. An improved automated process was needed to identify when inventory approached or fell below the reorder threshold. As the company expands, it will seek additional ways to automate reporting on its new database to support its customers better better better and ensure that high-demand products are available as often as possible.

Of all the tables I created, one didn't require 20 records. That was the store table. There are only 2 locations in my organization, and adding 18 unnecessary placeholder records would not be feasible. On the other hand, because the locations table can track the locations of offices, customers, and employees in a single table, it doubled in size relative to the others. Overall, this database is a good start, and I expect it will be slightly improved before the final submission to incorporate a broader range of reporting into the collected data.

Database Administration

Customer data and the ability to convey a sense of safety, security, and integrity are critical to the success of your business in the eyes of the customer whose data you possess. In this section, the organization aims to address concepts and processes that will yield an optimal level of structure for the proposed new database solution. We are operating on a series of assumptions;

- The highest volume of orders typically occurs during midday (both online and in-store)
- We are going to hire a single database administrator/owner to address these functions.
- We need to implement a standard backup procedure to save data and reduce data loss.
- Data Recovery needs to be as of the last transaction.
- Uptime is expected to be continuous (no downtime), and staff support for these needs needs to be established.
- The database needs to be created to support future online transactions.

Over the following few pages, I will present the plan for addressing Database Administration, Transaction Management, Database Security, and the Backup and Recovery model we intend to implement. Handling all of these will bring our database management operations up to code and operationally efficient. “Before a newly installed DBMS can be used effectively, standards and procedures must be developed for database usage. Studies have shown that companies with high levels of standardization reduce the cost of supporting end users by as much as 35 percent or more, as compared to companies with low levels of standardization.” (InformIT, November 7, 2012).

Database Administration Plan

The first step in the Database Administration plan is to identify all components that must be managed. We will then hire a Database Administrator who will also serve as the Database Owner to implement and manage all identified components. In our research, we have identified the following qualities as needed for this role to own/manage:

- Installing Software
- Configuring Database Servers
- Managing and Monitoring System Operability, Health, and Security
- Designing Efficient Backup Processes for The Servers and Associated Data
- Creation and Management of Accounts for Users at Various System Security Levels
- Document and Implementation of Disaster Recovery Protocols
- Establishment of End-to-End Tech Support and Resolutions
- Scheduling and Handling Routine Server Maintenance
- Creation of Data and Database Management Procedures and Standards
- Continuous Evaluation of Data Analysis and Procedures for Efficiency, Practicality, Integrity, and Security.
- Develop Cross-Training Guides to Ensure Standard Practices Can be Adhered to by Everyone Involved with the Database, both current and potentially new hires.

Once we have identified the role's needs and requirements and hired for the position, we should begin practices to build the database to meet the organization's needs and requirements, and then normalize the data to ensure it is fit for use/purpose. Before we implement new hardware and software, we want this new database administrator role to participate in developing the plan and communication standards for this process. One major issue we need to address is the

development of a standard communications management plan. Having the organization aligned will drive efficiency practices and support the highest possible uptime of this new system.

We expect this new role to identify and define the following standards and procedures within the first 45 days of the engagement. The days following that 45 days will be the practical implementation of the following standards and guidelines:

- Statement of Intent Regarding Organization's Policies around Data, Data Management, and Importance to the Company
- Data Ownership/Stewardship Guidelines
- Rules for Data Creation, Updating, Deleting, and overall Management.
- Logical & Physical Data Models and Guidelines Around Maintenance of the Models.
- A Goals Statement Regarding Establishment, Development, and Maintenance of an Enterprise Data Model.
- Data Sharing Policies Across the Organization
- Documentation for Data Analysis, Thresholds, Expectations, and Standard Operating Procedures for Handling Data falling out of expectations.
- Communication Guidelines between Database Administration and Operations to Ensure Effective Database Management Procedures and Operations.

Transaction Management Plan

"A transaction is one or more SQL statements that make up a unit of work performed against the database, and either all the statements in a transaction are committed as a unit or all the statements are rolled back as a unit. This unit of work typically satisfies a user request and ensures data integrity." (TechTarget, July 27, 2009)

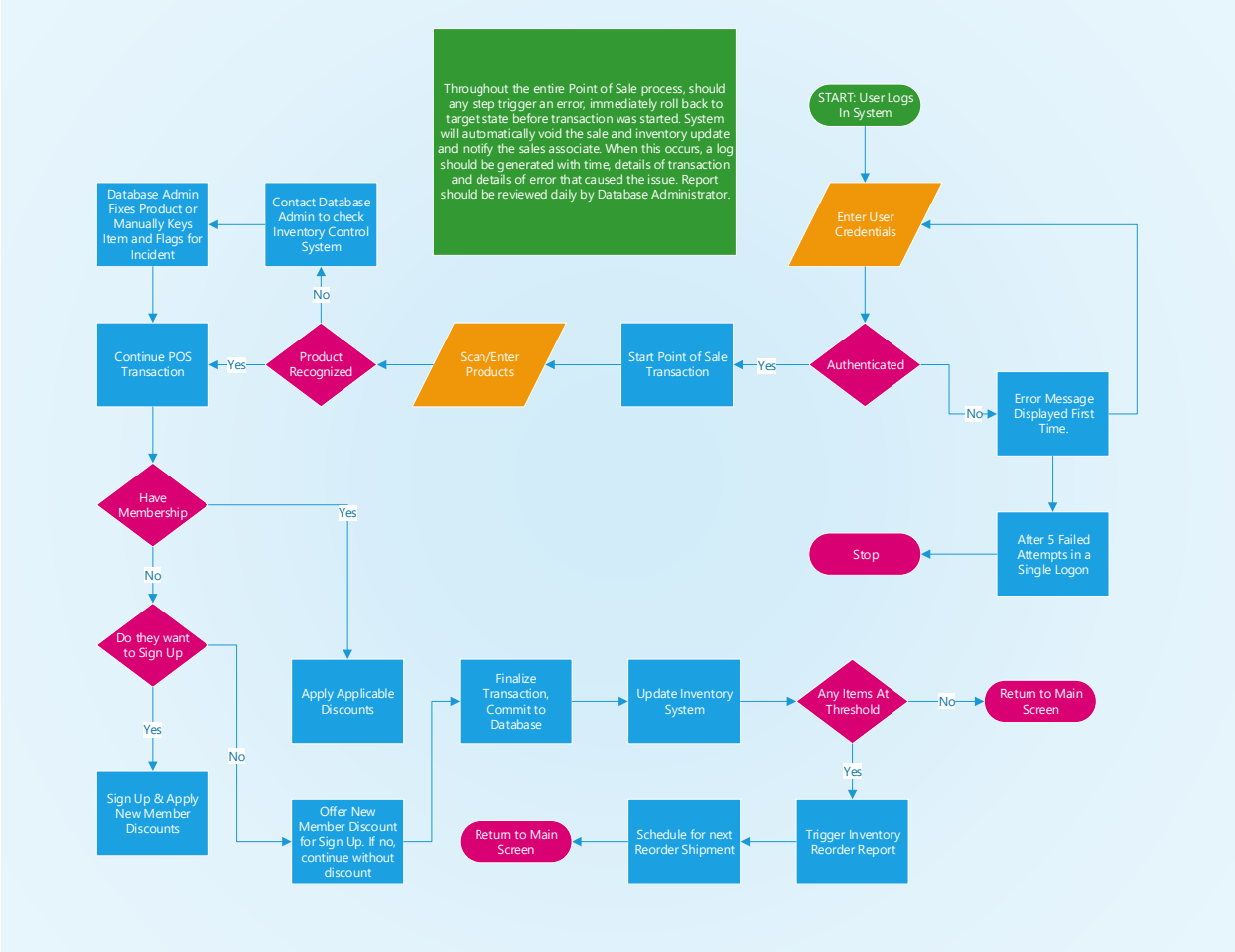

Figure 2 - Transaction Flow

To ensure this Transaction Flow Diagram can be read, the following is the attachment of the above diagram:

IP4_Transaction_Management.vsdx

Database Security Procedure

When working with Customer data, database security is of the utmost importance. As part of the initial phase of this new Database Management System, we are focusing heavily on our internal system users to ensure the right people have the proper level of access to perform

their jobs well and not unnecessarily affect other components or back-end procedures they should not be impacting. To handle this correctly, we need to implement access control mechanisms in our system (both Point of Sale and Back End). We will implement a Role-Based Access Control system. The Database Administrator will oversee this implementation. This will allow everyone in the company to log in to their own station or to a station with their own credentials, with their work session managed entirely within their own session and authenticated on the machine they are operating. Based on your role, upon login, you will be presented with the applicable level of options you can perform. These will be managed in the Active Directory for the system.

Authentication will be Username and Password. We are not using multifactor authentication in the early stages; however, we will pursue it as we expand into web sales and additional retail operations. The password will require strict rules and will be defined by the Database Administrator. “Strong passwords in the database are enforced when technically possible, and database passwords are encrypted when stored in the database or transmitted over the network.” (UC Berkley, n.d.). System uptime should be at least the store's operating hours and ideally 24/7. For that to be possible, we want to operate on more than 1 node and server. When one server undergoes maintenance, the other remains active. Should the active server begin to exhibit warning signs of degradation, the Database Administrator may invoke procedures to cut over to the optimized inactive node. The procedure should appear seamless to the end user and enable triage of the former active system. Both systems should maintain real-time transaction processing and back each other up to ensure that the last transaction is the most current, should a rollback be required.

Backup Plan & Recovery Model

"One of the key responsibilities of a database administrator (DBA) is to prepare for the possibility of media, hardware, and software failure as well as to recover databases during a disaster. Should any of these failures occur, the major objective is to ensure that the database is available to users within an acceptable time period, while ensuring that there is no loss of data." (ISACA, 2012)

The Database Administrator will need to provide a plan that identifies:

- Which data is required to be backed up?
- What is the appropriate backup type to use?
- What is the strategy for handling the backup?
- What is the appropriate schedule and window within which backups will occur?
- Where are backups and their logs stored?
- What is the retention policy for backups?

There is an explicit goal to automate as much of the backup process as possible. Backups must be tested continuously throughout the process and monitored for any disconnect from the process. Validation points should be established throughout to ensure data integrity. Backups should provide a comprehensive log documenting any deviations from expected values as determined by the DBA. "The DBA team must draft a backup and recovery SLA, covering details of backup procedures and including a timeline for recovery, and have management sign off on it. The SLA does not assist in the recovery process itself but sets the user community's (and management's) expectations for the recovery process, which may provide the team more time to complete the restore process." (IASCA, 2012).

Analysis: How this section fulfills the Mission and Goals of the Organization.

In the fourth week of the assignment, the focus was on database management from the perspective of the database Administrator. Before you can define what the role needs to do, you must evaluate the company's goals and objectives as they relate to system operations. In the past 3 weeks, we have identified several business goals. This week, we will align those with system-based goals that support the system's demands from the business side. One critical component of the company's mission in this implementation is the management of data on customers and their memberships. By tuning the database to enhance security for customer data and strengthening access controls, you provide customers with greater assurance that their data is secure. Invoking the DBA role to manage controls on system standards and operating procedures to ensure system uptime also strengthens the case for beginning to support online sales. Having a well-functioning database and operational procedures allows the company to grow significantly. This aligns very effectively with the goals established during the first three weeks.

Future Database System Implementation Plan

Difference Between Object-Oriented/Relational and Web-Based Database Systems

Measure	Relational DBMS	Object-Oriented DBMS
Data Storage	Entities defined as Tables	Objects
Complexity of Data	Handles More Simple Data	Handles More Complex Data
Data Handling	Only Stores Data	Stores Data and How to Use It
Primary Objective	Data Remains Independent from Applications	Data is Encapsulated
Key	Primary Key is the unique identifier for an item in a table	"Object Identifier (OID) is an unambiguous, long-term name for any type of object or entity." (GeeksForGeeks, n.d.)

Table 2 - Difference Between Databases

There are many differences between Object-Oriented Database Management Systems and Relational Database Management Systems. The fundamental differential measures are explained above. Relational databases are more akin to programming languages with which many are familiar, such as SQL. If you've worked in an Information Technology Role, you have likely crossed paths with one or more RDBMS's.

Object-oriented DBMSs are designed for more complex data organization and storage. An ODBMS is intended to facilitate concepts such as:

- classes of objects – A class in ODBMS refers to a collective grouping of elements that share a standard definition. The values are the different instances that fall within the standard definition.

- object identity – “Identity is a property of an object that distinguishes the object from all other objects in the application.” (Khoshafian S, Abnous R, 1990)
- polymorphism – Greek for “having multiple forms.” This refers to the ability of a data element to exist in multiple formats, provided that the application that sources the information can determine the appropriate usage and format.
- Encapsulation – This refers to processing and functional behavior being grouped with the object. This means the data and the code used to process it are packaged together.
- Inheritance – This term applies to an object hierarchy where a lower object can access (or inherit) the data class behaviors that exist above it within the hierarchy.

When you also consider Web-based DBMSs, you have another set of options that may work for your business. “A web-based database management system is used to handle those databases that have data regarding E-commerce, E-business, blogs, e-mail, and other online applications.” (W3 Schools, n.d.). Web-based DBMSs are more open and flexible with a wide variety of object structures. At the same time, RDBMS and OODBMS are typically (though not always) defined and hardware-driven on-premises; Web-Based DBMS offers greater flexibility and the ability to leverage on-demand cloud infrastructure, where users pay for what they use. Most Web DBMSs are platform-independent, easy to use, and have unique graphical user interfaces (GUIs) that facilitate quicker training and logical use for building and managing databases.

Changes Needed if Converting to Data Mart / Data Warehouse

Data Warehouses are enterprise-wide constructs designed to separate data from a system's operational components. Data Marts are subsystems of the Data Warehouse. Each Data

Mart has a common differentiator that identifies where the data belongs and which Data Mart it belongs to within the data warehouse. Multiple independent database systems can be integrated using ETL (Extract, Transform, Load) into a Data Warehouse. There, operations are handled in individual databases and, through some level of processing, are then integrated into the data warehouse and into appropriate data marts.

As the company continues to grow and expand into different retail locations, expand their web sales to larger markets, and even expand globally in the distant future, it would make more sense to make sure system operations are more secure and maintained, and backed up to a data warehouse for improved analytics and better management of integrated systems. Changes required would include establishing the formal data warehouse structure and defining how data should be leveraged from the warehouse and its marts. Once that has been identified, then the ETL process can be created to normalize and standardize the data. Finally, the independent source systems can be integrated into the Data Warehouse and allocated to appropriate Data Marts. Regardless of which DBMS we select for our organization, each can be backed up and integrated into a data warehouse with appropriate ETL.

Considerations for Making a Database Distributed

As ironic as this may sound, because we manage our operations and sales at the individual store level, we have continuously operated in a distributed model. If we wish to continue this model, more accountability and data management will need to be standardized and maintained at the individual store level. In contrast, processing and integration into the data warehouse must be adhered to across all sites. One significant benefit of a distributed database system is that if one store fails, the others do not. This could allow us to quarantine the issue, address and resolve it locally, and then bring the system back online to the network.

Business Intelligence and How It Can Improve Decisions

Knowledge is power, and businesses need to be aware of specific metrics to maintain consistency. When you work in an industry that is progressively evolving, data is your greatest asset. The data your company possesses and how you use it to produce informational reports could inform future business direction or prevent a significant issue from becoming too large. Business Intelligence can better align the highest-level stakeholders with the workers who see what the company does on a day-to-day basis. A great example is seeing how a product is selling for a particular demographic. If a new product is introduced that performs well with, or is superior to, your product, you can structure your sales plan accordingly. Data of this magnitude can also be used to forecast future business decisions based on previous patterns of customer behavior. In the retail sector, this can be one of the most effective components of a company.

Data Warehousing Benefits

Data Warehousing itself has many benefits in large organizations. One of the first identifiable capabilities, as noted previously, is the ability to separate data from the operational aspects of your organization. This enables more comprehensive analytics without affecting operations. This also facilitates a better backup and recovery plan should any portion of the operational model fail and require the reload of data backed up to a point in time.

ROI on Business Intelligence-Based Initiatives (3-Year Estimate)

Given that our retail operation closely monitors its data to identify which products sell better and to which demographic, and to promote an event-based system that encourages more frequent, more targeted shopping, it is clear what goals we aim to achieve over the next 1-3 years. We expect to see an increase in revenue of 15-25% year over year. We also want to see

memberships increase by 10% each month. That means for every sale, we want to have a membership associated with it ultimately. The goal at the 3-year mark is to have 70% of sales related to a membership ID. This will also drive opportunities for events and potentially more retail locations to support the larger interactive membership base. By monitoring and evaluating our data and sales trends, we can continually model them and identify what we need to improve to meet that goal.

Competitive Advantages

Another primary goal of our data warehousing and business intelligence is to use publicly available competitor information to improve our statistics on which products and brands serve which demographics. Gaming is experiencing a notable resurgence, and there are many businesses catering to different styles and flavors of gaming. Our industry needs to identify which companies are trending within our demographic ranges, and we need to capitalize on innovative methods to attract consumers to enjoy and purchase those products. While we don't intend to eliminate our competitors, we want to position ourselves as the primary option consumers choose, if possible.

Increased Productivity of Decision Makers

Our stakeholders have been well informed and have consistently hit the ground running to understand what drives good business in this industry. By providing them with improved metrics on our data, we can enable more informed decisions that will improve the company's future performance. By centralizing data and strengthening business intelligence, with the specific aim of providing appropriate statistics to our stakeholders, we can ensure that the company continues not only to thrive but also to remain at the forefront of the future of gaming and consumer needs.

Addressing Potential Future Data Warehousing Concerns

No matter how hard you try, you will always find something better or a missed opportunity you would like to incorporate. The company's future can only improve as data quality improves. To better plan for this, I highly recommend integrating budgeting into the entire process for ongoing reevaluation of systems and data to determine whether we can leverage improvements. As we embark on improving our database management system, we need our new Database Administrator role to focus on the most efficient ways to leverage continuous improvement.

Change in Requirements around Data Capture

Practical Requirements Elicitation is an essential skill in the early stages of this development effort. Post-production, if requirements change, there should be a process for addressing them. A Submission process that specifies the changes, acceptance criteria, details, and identification of impacted systems is mandatory. Upon receipt, the DBA should process this and assess the time required to implement the change in a lower environment. Once documented, please share it with the stakeholder team to prioritize and determine whether, when/where it makes the most sense to build. Start building in a lower environment that mirrors production and testing. Ensure that the correct data is available to facilitate testing. Move to a middle-tier platform and request that the business review the improvements. The process should be aligned with typical release schedules and maintained as such. Instances of emergency fixes or security breaches should be prioritized and addressed accordingly.

Increased Demand for Disk Space & Resources

As the company expands and data capture is retained, it will continue to grow. As with changes to requirements, this should also be anticipated. The process for improving any facet of

database operations and hardware should be clearly defined. Risks and environmental assessments should be reviewed iteratively for continuity. Effective monitoring and reporting should yield insights into this much earlier on. The DBA should know which effective thresholds are recommended for initiating discussions on improving space and resources. The plan for addressing these changes should be clearly articulated in a communications strategy and database management document. Plans for increasing or managing disk space and resources will be evaluated every 3-6 months by the DBA, who will conduct any required process reviews.

Discovering Hidden Problems with Source Systems

If a problem is discovered, it's not technically hidden. It may be unanticipated and revealed over time. Still, when that occurs, if the DBA has done their job effectively in pre-production, there will be a process and detailed documentation that addresses how and what to do when hidden problems come to light. There should be a documented process for handling high-priority issues efficiently and effectively. This should also be addressed in the communications management plan. The problem should be well documented, including what occurred, the anticipated results, and the actual results. As with resource and disk-space demand, there should be a process involving the relevant stakeholders to assess the issue's priority and the timeline for resolution.

Analysis of How This Pleases Fulfills Mission and Goals of Case Study Organization

This final phase of the document synthesizes all we have built and evaluates the best approach to implementation and anticipates potential outcomes. After you go into production, it's all about monitoring and control. Ensuring that your data works effectively for you and that you can use it to make informed decisions is a critical success factor. I believe that, for the case

study organization, I have evaluated all necessary components and can proceed to the presentation to propose improvements to their database management system.

References

Buchholtz, Michael Ryan, CIA, CPA, and Kumar Setty, CISA. https://www.isaca.org/Journal/archives/2012/Volume-1/Pages/Database-Backup-and-Recovery-Best-Practices.aspx

Essential SQL (n.d.). *Database Second Normal Form Explained in Simple English.* https://www.essentialsql.com/get-ready-to-learn-sql-10-database-second-normal-form-explained-in-simple-english/

GeeksForGeeks (n.d.) *Difference between RDBMS and OODBMS.* https://www.geeksforgeeks.org/difference-between-rdbms-and-oodbms/

InformIT (November 7, 2012). *Database Administration: Creating the Database Environment* by Craig S. Mulling. http://www.informit.com/articles/article.aspx?p=1963781&seqNum=4

TechTarget (July 27, 2009). *An Introduction to Database Transaction Management.* https://searchdatamanagement.techtarget.com/feature/An-introduction-to-database-transaction-management

UC Berkley (n.d.). *Database Hardening Best Practices* https://security.berkeley.edu/education-awareness/how-articles/system-application-security/database-hardening-best-practices

W3 Schools (n.d.) *Web-Based Database Management System* https://www.w3schools.in/dbms/web-based-database-management-system/

Your Article Library (n.d.). *Data Base Management System (DBMS): Meaning, Nature, and Objectives* by Priyali Sharma.

http://www.yourarticlelibrary.com/management/dbms/data-base-management-system-dbms-meaning-nature-and-objectives/70357