


PLAYON TOYS DUBLIN

DATABASE MANAGEMENT FEASIBILITY STUDY

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1.0 Introduction

PlayOn Toys operates a toy manufacturing facility in Co. Dublin for the European market. The company has seen rapid growth in the past year and now plan to expand their customer base in America, Asia and Africa over the next three years. They currently manage about 3000 sales orders per year, spread across approximately 200 customers. However, their reporting and transaction requirements are highly dependent on manual processing, rapid growth has created difficulties in the inadequacy of its current IT infrastructure.

At present, product, customer, sales and financial information are all spread across a number of small databases, electronic files and paper files at the Dublin site. PlayOn manages about 3000 sales orders per year, spread across approximately 200 customers. Their manufacturing operation, has expanded from 2 products to 20 different products over the past two years. These 20 products in turn, consist of 110 different product parts, sourced from 30 suppliers. Customers enters sales orders on the PlayOn Toys website, in the background sales information is simply emailed to one of the sales administrators who have to print it and log in a spreadsheet.

PlayOn Toys engaged rDynamics Consultancy Ltd to conduct a Feasibility into implementing a Database Management System for their Dublin site. This feasibility study will review the current market on Database Management Systems (DBMS) and if PlayOn Toys should use one, DBMS alternatives, whether PlayOn Toys should use a closed and open source DBMS, an Enterprise Resource Planning Systems (ERP) or cloud data management. For the ERP Systems this report will include an Entity Relationship Diagram and description of some of the typical functions found.

The report will then propose six options for PlayOn Toys;

1. Option 1: Use an Open/Closed Database Management System vs Alternative Management System.
2. Option 2: Use an ERP System
3. Option 3: Use an External Cloud Data Management

The report will look at the pros and cons of each option, estimated cost, potential suppliers then conclude with a recommended option for PlayOn Toys to consider.

2.0 Market Overview

2.1 Background

A database is an electronic central repository for data that relates to information collected and stored for future retrieval. The physical version of this would be files and folders found in a typical office.

DBMS come in four different types; Hierarchical databases, Network databases, Object-Oriented databases and Relational databases. In Hierarchical databases, data is represented in a tree like structure. The Network database is an upside-down version of the hierarchical database structure. Object-Oriented databases represent data as an object with sub parts, similar to a car engine with its several standalone sub components. Relational databases, which are the most popular, stores and provides access to data points that are related to one another.

2.2 Why PlayOn Toys should use a Database Management System

A Database Management System (DBMS) is designed to create, read, update and delete information stored in a database. Database management systems can also manipulate the data format when it is stored as well as field names, record structures and file structures. It can also define the rules that manipulate and validate the data. This is the opposite to what PlayOn Toys currently have, which is information simply stored in either emails or spreadsheet. A DBMS would allow PlayOn Toys to create their own database to store information relating to their 200 customers, 20 products, 110 different product parts and 30 suppliers that could be used by its future sister sites in America, Asia and Africa. With PlayOn Toy expanding it is important to consider the amount of data and data storage, current spreadsheet software capacity is limited to a maximum of 1 million rows of data. However, PlayOn Toys will see product, part, supplier, customers, employees all increase. The calculation below shows PlayOn Toys will max out it's spreadsheet capabilities in 1 year and 3 months:

Products			Materials	
Products [n] y1	2		number parts per product	1,980
Products [n] y2	20		suppliers	20
products p/a	18			
Sales			Labour	
sales p/a	3,000		Sales Administrator (assume	50
customers [n] p/a	200		Warehouse (assume 1 handl	5
sales per customers	15		Staff per year	55
Assume 80% repeat customers	160			
Assume 80% repeat sales	2,400			
Total new& existing sales p/a	5,400			
Spreadsheet Storage				
Total tuples (suppliers increase with products)	76,730			
Years	10	Max capacity	1,000,000	
Total in n years	767,301	Years until spreadsheet full.	1.3	

As PlayOn Toys uses more applications, a DBMS can be an efficient handler for all of them to share the same data set. User access control can be issued to grant some customer payment information for handling sales while other users in the warehouse to receive and ship products. Data integrity is improved with a DBMS, ensuring mistakes and possible deletion of information are minimised. There are some disadvantages however, that PlayOn Toys should be aware of, such as costs being high

depending on the complexity of the database. PlayOn Toy staff will require training. Unless backed up there is a risk of data corruption in the event of a power failure.

2.3 Open vs Closed Source Database Management Systems

Closed source databases are private and cannot be viewed or changed by anyone. PlayOn Toys would have to pay a licencing fee. A closed system can come with paid support if PlayOn Toys lacks IT resources to maintain the system.

Open source databases are free and usually have a community that supports them with updates. The database code can be downloaded and modified. PlayOn Toys could customise the code to their own needs and distribute it freely to other sites without being locked in with any one vendor.

PlayOn Toys can reduce their costs of implementing a database management system if it was Open source.

Several database management systems were reviewed both open and closed source (see Appendix 2), the follow three were selected as suitable for PlayOn Toys.

2.3.1 MySQL (Open)

Created in 1995, purchased in 2008 by Sun Microsystems and then again by Oracle in 2009 MySQL is a semi open source Relational Database Management System (RDMS). Semi open as in it is still free but now instead of being maintained by a community it is maintained by a team of engineers at Oracle.

Pros: Oracle has invested a lot of money and resources into MySQL since purchasing the system. The current system is fully featured with improved performance. It has 64 CPU threads which have tripled the amount of database access requests from prior versions. Feature capabilities for Web, Cloud and Big Data

Cons: May not be as mature as other RDMS such as Postgre SQL so may not be as feature rich. Not as open source any more with more proprietary, closed-source modules. Some allege development along with releases for patches and security bugs have slowed. Red Hat Enterprise Linux, Fedora, Slackware Linux, openSUSE, and the Wikimedia Foundation have all moved to other systems.

2.3.2 Microsoft SQL Server (Closed)

Microsoft SQL Server (MSSQL) is a widely used closed database systems. Developed exclusively for the Windows operating system.

Pros: MSSQL allows queries to be cancelled once they start running, MySQL cannot do this. MSSQL doesn't block the database while backing up data. MSSQL won't binaries or database files to be manipulated unless it's an instance. Hackers cannot access or directly manipulate data making MSSQL more secure.

Cons: Expensive and complicated licencing. It is estimated that a standard licence for MSSQL is €15,000.

2.3.3 MariaDB (Open)

MariaDB is made by the original developers of MySQL with a focus to remain open source and is the default in most Linux distributions.

Pro: Designed to be a drop-in replacement for MySQL with more features, a different storage engine, and improved performance. MariaDB is free, and is simple to use requiring less training.

Cons: MariaDB won't allow query parallelism meaning it can only process one query at a time. It also has limited bulk data loading.

2.3.4 Alternatives

There are various alternatives to relational databases such as MySQL. Some notable mentions are SQLite, MongoDB (NoSQL) and cloud storage such as Microsoft's OneDrive or Google Drive. SQLite is a quick and free way to get up and running with SQL but will not allow multiple sites to use the system as it is run locally. MongoDB is worth reviewing in the future as it is good for scalability but as a starting system MySQL is older and better documented. OneDrive & Google Drive should be used but not as a main repository of information, they do not easily allow applications to use the data stored.

2.4 Enterprise Resource Planning Systems

ERP systems are designed around a single, defined data structure (schema) that typically has a common database. This helps ensure that the information used across the enterprise is normalized and based on common definitions and user experiences. These core constructs are then interconnected with business processes driven by workflows across business departments (e.g. finance, human resources, engineering, marketing, operations), connecting systems and the people who use them. Simply put, ERP is the vehicle for integrating people, processes, and technologies across a modern enterprise.

2.5 Cloud data managements

Database systems stored and accessed through the web such as Amazon Aurora have the same capabilities of traditional databases but much of the maintenance, upkeep and storage is abstracted away this can be easier and cost effective but poses a risk to PlayOn Toys getting vendor locked in. With Aurora for example PlayOn Toys will get billed \$0.10 per GB-month and \$0.20 per 1 million requests so high performance will mean costs higher than RDS MySQL. For RDS MySQL, storage costs just depend on the EBS type and size.

3.0 Options review & 30% cost estimates

The following section layout three options for Playon Toys complete with cost estimates for each. At the end is preliminary duration to implement a system in PlayOn Toys and recommendations to consider.

3.1 Option 1: Use MySQL (Open DBMS)

PlayOn would migrate their website over to use a PHP backend website with MySQL, designs approximately 13 tables in Erwin and imports them into the MySQL database.

Direct Costs	Materials: MySQL Licence: €0 PHP Licence: €0 Server costs: €100 p/a Training Material: €500 Labour: Backend Developer: €12,000 Staff Trainer: €1,000
Indirect Costs	Database Architecture Design: €3000
Product Management	Project & Implementation: €1,000 Commissioning: €200
Sub Total	€17,800
Project Contingencies @10%	€1,780
Total Cost of Option 1:	€19,580

3.2 Option 2: Use SAP ERP System

PlayOn would hire a SAP Business Implementation partner to integrate their website with SAP and migrate their data over.

Direct Costs	Materials + Labour: SAP User Licences x 8 incl site install team: €50,000
Indirect Costs	Database Architecture Design: €3000
Product Management	Project & Implementation: €1,000 Commissioning: €200
Sub Total	€54,200
Project Contingencies @10%	€5,420
Total Cost of Option 2:	€59,620

3.3 Option 3: Use Amazon Aurora Cloud Data Management

PlayOn would hire an Amazon Aurora Business Implementation partner to integrate their website with SAP and migrate their data over. According to Tsalouchidis (2020), Aurora instances will cost PlayOn Toys approximately 20% more than MySQL.

Direct Costs	Materials: MySQL Licence: €0 PHP Licence: €0 Server costs: €100 p/a Training Material: €500 Labour: Backend Developer: €12,000 Staff Trainer: €1,000
Indirect Costs	Database Architecture Design: €3000
Product Management	Project & Implementation: €1,000 Commissioning: €200
Sub Total	€17,800
Amazon Aurora @20%	€21,367 (base + €3,567)
Project Contingencies @10%	€2,137
Total Cost of Option 1:	€23,504

4.0 Preliminary Timeline

Implementing a database management system in PlayOn Toys will take approximately 8 months to complete.

Stage	Elements	Duration
Pre-Feasibility	FEL-1 Options Appraisal & Feasibility (FEL-2 Option Selected)	.25 Month
Feasibility	FEL-3 Option Defined & URS	.25 Month
Funding	Capital Funding Request	1 Month
Detailed Design	Tender Pack Generation	4 Month
Tender & Procurement	RFQ, RFP, TBA	1 Month
Install & Pre-Commissioning	Completion Cert	.5 Month
Commissioning	Install & Function Tests	.25 Month
Playon Toys Handover & Project Closeout	User Training	1 Month

5.0 Recommendations

1. PlayOn Toys should invest in a MySQL open relational Database Management System (RDMS) as it is free and scalable as opposed to the alternatives.
2. Spreadsheets for storing information should be ceased and data migrated over to the RDMS as PlayOn Toys only have about 1 year and 3 months until capacity limit is reached if expansion continues.
3. As PlayOn Toys expands further it should review implementing SAP as its ERP system. It would be less costly and quicker to first implement a MySQL RDMS basic version as show in Appendix 7.2 before considering SAP.

6.0 Appendix

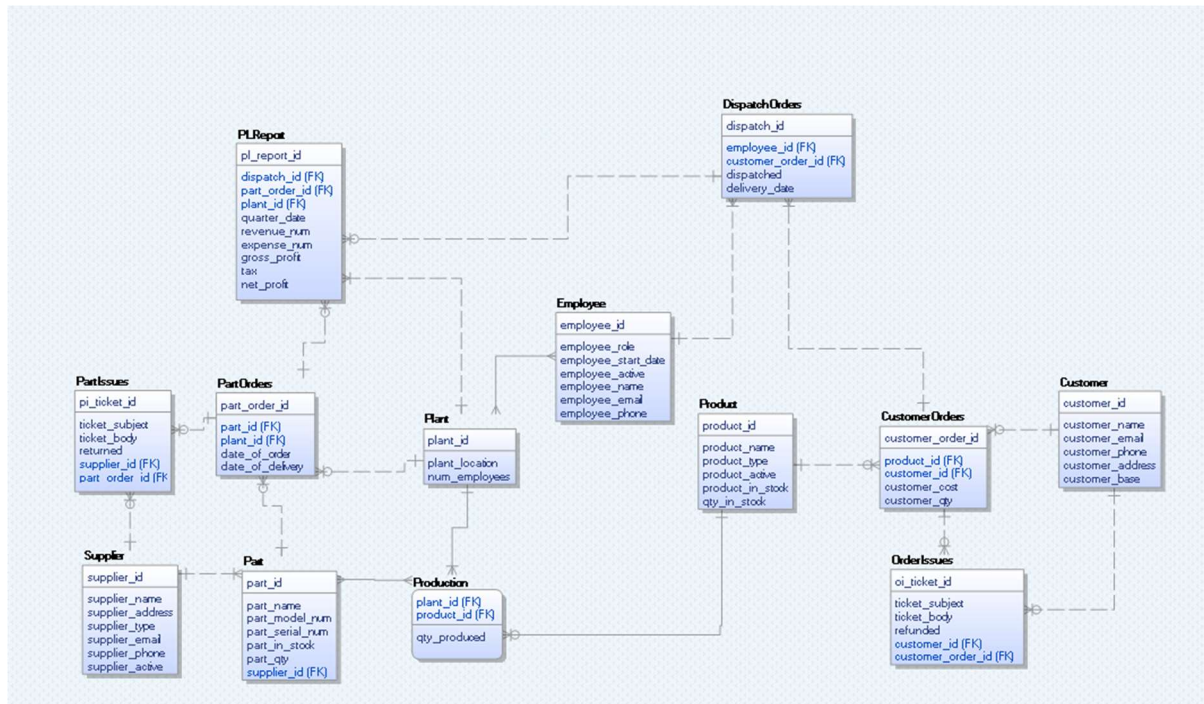
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7.2 Popular Database Management System

MySQL	Microsoft Access	Oracle	PostgreSQL	dBASE	FoxPro	SQLite	IBM DB2
LibreOffice Base	MariaDB	Microsoft SQL Server	Altibase	MongoDB	Cassandra	Cubrid	

7.3 Erwin ER model of typical ERP System



7.2 PlayOn Toys Database Inputs

Product	20 products
Part	110 different parts for products
Supplier	30 suppliers
Employee	Sales Administrators
Plant	Dublin
Customer	200 customers Customer base; Europe, America, Asia, Africa
Sales and financial information	3000 sales orders per year Electronic files and paper files